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AEFA

AIRWORTHINESS AND FLIGHT CHARACTERISTICS EVALUATION OF AN IMPROVED ENGINE AIR FILTRATION SYSTEM ON THE UH-1H HELICOPTER

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The U.S. Army Aviation Engineering Flight Activity conducted an Airworthiness and Flight Characteristics evaluation of the UH-1H aircraft with an Improved Engine Air Filtration System (IEAFS) installed and with the standard filter installed between 16 September 1987 and 29 February 1988. Aircraft performance and handling qualities, engine-air induction system compatibility, and engine performance with the IEAFS installed were evaluated. This evaluation was conducted at Edwards AFB, California. Twenty-five flights were conducted for a total of 20.1 productive flight hours. The aircraft performance and handling qualities, engine vibrations, and inlet temperature characteristics with the IEAFS installed are not significantly different from those of the standard UH-1H. The inlet pressure distortion and engine installation losses with the IEAFS installed are less than those of the standard UH-1H. One deficiency, the poor reliability of the IEAFS latch rivets, was identified. One shortcoming, the poor reliability of the latch lever locking device, was identified. Both the deficiency and the shortcoming should be corrected before production.

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INTRODUCTION

BACKGROUND

1. The current concept of Army helicopter employment dictates that the majority of the operational flying will be in the nap-of-the-earth environment. In this type of employment, the helicopter will encounter clouds of fine dust in desert operations. The Army contracted for an improved engine air filtration system (IEAFS) to enhance operations in desert environments without degrading other operational capabilities. An IEAFS was developed and tested for the UH-1H helicopter by Pall Land and Marine Corporation and Bell Helicopter Textron, Inc, (BHTI). Ground and wind tunnel testing of the IEAFS has shown improvements in both filtration and installation losses. The U.S. Army Aviation Systems Command tasked (ref 1, app A) the U.S. Army Aviation Engineering Flight Activity (AEFA) to conduct an Airworthiness and Flight Characteristics (A&FC) evaluation to verify the engine-air induction system compatibility and determine changes in handling qualities and performance capabilities with the IEAFS installed on the UH-1H helicopter. The evaluation was conducted in accordance with the approved test plan (ref 2, app A).

TEST OBJECTIVES

2. The objective of the A&FC evaluation was to determine the effects of the IEAFS on the handling qualities, performance, and engine induction system characteristics of the UH-1H helicopter.

DESCRIPTION

3. The UH-1H is a single-engine helicopter with a Lycoming T53-L-13B free turbine engine rated at 1400 shaft horsepower (shp) uninstalled at sea level standard day conditions. The main transmission is limited to 1137 shp for continuous operation. A more detailed description of the UH-1H is contained in reference 3, appendix A, and appendix B. The standard filter installed on UH-1H helicopters serial no. 68-15779 and subsequent is an inertial self-purging separator that uses engine bleed air. A more complete description of the standard filter is contained in reference 3 and appendix B. The IEAFS is an inertial type air particle separation system designed to increase engine service life in desert environments. It uses swirl tubes and bleed air, and consists of upper and lower halves. It is designed to replace the standard filter, but is designed to allow reinstallation of the standard filter. A more detailed description of the IEAFS is contained in references 4 and 5, appendix A, and appendix B.

TEST SCOPE

4. The evaluation consisted of testing to determine the effects of installation of the IEAFS on aircraft performance and handling qualities, engine vibration, inlet distortion, and air induction system. The evaluation was conducted at Edwards Air Force Base, California (field elevation 2302 feet). A total of 31.3 flight hours (20.1 productive hours) was flown during 25 flights between 16 September 1987 and 29 February 1988.

The test aircraft was operated within the limitations of the operator's manual as amended by the airworthiness release (ref 6) except as noted in paragraph 21. The evaluation was conducted at the conditions shown in tables 1 through 3.

TEST METHODOLOGY

5. Established flight test techniques (refs 7 and 8, app A) were used and are discussed in appendix D. The Handling Qualities Rating Scale (fig. D-1) and the Vibration Rating Scale (fig. D-2) were used to supplement pilot's qualitative comments. Flight test data were recorded manually and by on-board magnetic tape. A listing of test instrumentation is contained in appendix C. Data analysis methods used are presented in appendix D.

Table 1. Aircraft Performance Test Conditions

Test	Average Gross Weght (lb)	Average Longitudinal Center of Gravity (FS)	Average Density Altitude (ft)	Trim True Airspeed (kt)	Average Referred Rotor Speed (rpm)	Configuration	Flight Condition
Hover	7300[1]	138.9[2]	990	0	330.4	Standard Filter	60-ft skid height (OGE[3])
			980		300.8		
			1030		331.4		
			1140		300.0		
	7460[1]	139.5[2]	940		332.2	IEAFS	
					301.4		
			1040		330.3		
			980		301.7		
Level Flight	7160	138.4	5450	36 to 107	312.7	Standard Filter	Level, ball-centered unaccelerated flight
	8490	136.9	5200	36 to 100	313.0		
	9190	138.2	5820	49 to 108	312.5		
	7320	137.6	5180	39 to 121	313.6	IEAFS	
	8400	136.3	6030	40 to 116	312.7		
	9080	137.5	6510	39 to 112	313.6		

NOTES:

[1]Engine start gross weight, tethered hover technique.
[2]Engine start longitudinal center of gravity.
[3]OGE: Out-of-ground effect.

Table 2. Engine Vibration, Inlet Distortion, and Air Induction System Peformance Test Conditions

Test	Average Gross Weght (lb)	Average Longitudinal Center of Gravity (FS)	Average Density (Altitude (ft)	Calibrated Airspeed (kt)	Average Rotor Speed (rpm)	Configuration	Flight Condition
Engine Vibration, Inlet Distortion, and Air Induction System Performance	8700	137.0	3350	0	322	Standard Filter	Free hover; skid height = 3 ft to 51 ft
	8880	138.1	6500	90 to 92	323		Level flight with sideslip
	8900	137.7	3210	9[1] to 31[1]	323		Low-speed flight at 0-, 90-, 180-, and 270-deg relative wind azimuth
	9130	138.8	6760	54 to 91	323		Military-rated-power climb.
	9110	138.8	6950	53 to 92	326		Minimum-power descent.
	8750	137.1	2100	0	321	IEAFS	Free hover; skid height = 2 ft to 51 ft
	8800	136.8	7040	90 to 94	323		Level flight with sideslip
	8910	137.7	1970	10[1] to 31[1]	322		Low-sped flight at 0-, 90-, 180-, and 270-deg relative wind azimuth
	9030	137.7	6940	52 and 92	322		Military-rated-power climb.
	9010	137.6	7010	53 to 93	326		Minimum-power descent.
Engine Vibration and Inlet Distortion	9240	139.2	5830	44 to 101	309	Standard Filter	Level, ball-centered unaccelerated flight
	8920	138.1	6730	53 to 92	319		Autorotation
	9190	138.2	6430	43 to 101	311	IEAFS	Level, ball-centered unaccelerated flight
	8910	137.3	7120	52 to 92	310		Autorotation
Air Induction System Performance	8110	137.6	6760	58 to 100	324.5[2]	Standard Filter	Level, ball-centered unaccelerated flight
	7740	136.7	6760	67 to 102	313.8[2]		
	8110	136.4	6760	49 to 103	325.0[2]	IEAFS	
	7730	135.4	6790	39 to 108	314.2[2]		

NOTES:

[1]KTAS: Knots true airspeed
[2]Average referred rotor speed

Table 3. Handling Qualities Test Conditions[1]

Test	Average Gross Weight (lb)	Average Longitudinal Center of Gravity (FS)	Average Density Altitude (ft)	Calibrated Airspeed (kt)	Average Rotor speed (rpm)	Flight Condition
Static Lateral-Directional Stability	8780	137.0	6200	92	322	Level Flight
Maneuvering Stability	9000	137.7	5960	94	323	Left and right turns to approximately 45-deg bank angle
Low-Speed Flight Characteristics	8610	136.3	320 to 2190	0[2] to 33[2]	323	0- to 330-deg relative wind azimuth in 30-deg increments

NOTES:

[1]Tests conduted with IEAFS installed.
[2]Knots true airspeed.

RESULTS AND DISCUSSION

GENERAL

6. An Airworthiness and Flight Characteristics (A&FC) evaluation of the UH-1H aircraft with the IEAFS installed and with the standard filter installed was conducted at gross weights of approximately 7000 lb to 9500 lb and at density altitudes of approximately 300 ft to 7100 ft. The aircraft performance and handling qualities of the UH-1H with the IEAFS installed are not significantly different from those of the standard UH-1H. The low-speed handling qualities remain a deficiency as previously reported. An engine vibration survey indicates that the vibrations with the IEAFS installed are not significantly different from those of the standard UH-1H. The engine inlet pressure distortion with the IEAFS installed is less than that of the standard UH-1H. The engine inlet temperature characteristics with the IEAFS installed are not significantly different from that of the standard UH-1H. Rearward (180 degree azimuth) flight at a true airspeed of approximately 30 knots causes exhaust reingestion in both the UH-1H with the IEAFS installed and in the standard UH-1H. Engine installation losses with the IEAFS installed are less than those of the standard UH-1H. The poor reliability of the IEAFS latch rivets was identified as a deficiency. The poor reliability of the latch lever locking device was identified as a shortcoming.

AIRCRAFT PERFORMANCE

Hover

7. Hover performance was evaluat.d using the tethered hover technique with the standard filter installed and with the IEAFS installed. Results are presented in figure E-1. Hover power required with the IEAFS installed is unchanged from that with the standard filter installed.

Level Flight

8. Level flight performance was evaluated using the constant ratio of gross weight to air pressure ratio (W/δ) method at thrust coefficients of approximately 0.0032, 0.0038, and 0.0042 with the standard filter installed and with the IEAFS installed. Results are presented in figures E-2 through E-11. Level flight power required with the IEAFS installed is not significantly different from that with the standard filter installed.

ENGINE VIBRATION AND INLET DISTORTION

General

9. Engine vibration surveys and engine inlet pressure and temperature surveys were conducted at the conditions shown in table 2 with the modified bellmouth described in appendix C installed. The modified bellmouth was removed and replaced with a standard bellmouth at the conclusion of these surveys for the remainder of the testing.

Engine Vibration Surveys

10. Spectral plots of engine vibration are presented in figures E-12 through E-17 for selected flight conditions with the standard filter installed and with the IEAFS installed. The installation of the IEAFS does not significantly change the engine vibrations.

Inlet Distortion Surveys

11. Circumferential and radial total pressure distributions, as defined in reference 9, appendix A, and appendix D, and circumferential temperature distributions are shown in figures E-18 through E-79 for selected flight conditions with the standard filter installed and with the IEAFS installed. Reference 10, appendix A requires that, for the engine to meet guaranteed specification performance, circumferential and radial total pressure variations must not exceed ± 2 percent of average total pressure. At all conditions of these surveys, the circumferential and radial pressure variations were less than ± 2 percent of average total pressure. For each condition, both the circumferential and radial pressure variations with the IEAFS installed are less than the variations with the standard filter installed.

12. The circumferential temperature distributions indicate exhaust reingestion both with the standard filter installed and with the IEAFS installed in 180-degree-azimuth flight at a true airspeed of approximately 30 knots. As shown in figures E-72 and E-75, at this flight condition, the average inlet temperature was approximately 13°C higher than average ambient air temperature with the standard filter installed, and approximately 20°C higher than average ambient temperature air with the IEAFS installed. The limited data indicates that exhaust gas reingestion in rearward flight has a significant adverse effect on engine performance, both with the standard filter installed and with the IEAFS installed.

AIR INDUCTION SYSTEM INSTALLATION LOSSES

General

13. The effects on engine installation losses were determined at the conditions shown in table 2. Results are shown in figures E-80 through E-85, appendix E for selected flight conditions with the standard filter installed and with the IEAFS installed. The installation losses were less with the IEAFS installed. Engine inlet pressure recovery ratios are presented in table 4 for selected flight conditions with the standard filter installed and with the IEAFS installed. For each flight condition, the pressure recovery ratio with the IEAFS installed is not significantly different from that with the standard filter installed. This indicates that the decrease in installation losses with the IEAFS installed is principally due to the IEAFS using less bleed air than the standard filter. Determination of the bleed air requirements of the standard filter and the IEAFS was not within the scope of the A&FC.

Hover

14. The effects on engine installation losses in hover were determined in conjunction with the surveys of engine vibration and inlet distortion. Results are presented in figures E-80 and E-81. Throughout the range of skid heights and power required, installation losses were less with the IEAFS installed than with the standard filter installed.

Level Flight

15. The effects on engine installation losses in ball-centered unaccelerated level flight were determined at the conditions shown in table 2. Referred rotor speeds were chosen

Table 4. Engine Inlet Pressure Recovery Ratios

Flight Condition	Filter	Calibrated Airspeed (kt)	Referred Shaft Power (shp)	Referred Gas Generator Speed (percent)	Pressure Recovery Ratio[1]
Level, Ball-Centered Unaccelerated Flight	STD	93	877	94.7	0.957
	IEAFS		888		0.954
Climbing, Ball-Centered Flight	STD	91	1253	99.8	0.952
	IEAFS	92	1233	99.1	0.953
Descending, Ball-Centered Flight	STD	92	424	89.6	0.965
	IEAFS	93	280	86.9	0.963
Autorotation	STD	92	---	73.6	0.973
	IEAFS			72.8	0.972
Level, Unaccelerated Flight with Right Sideslip	STD	91	999	96.8	0.954
	IEAFS	92	915	95.2	0.958
Level, Unaccelerated Flight with Left Sideslip	STD	92	1010	97.0	0.953
	IEAFS	90	989	96.4	0.955

[1]Ratio of average total pressure at inlet to free stream total pressure.

to obtain average referred output shaft speeds approximately equal to the average referred output shaft speeds obtained during the engine calibration in the Corpus Christi Army Depot test cell. This was done to allow determination of installation losses by comparing engine performance on the aircraft to performance in the test cell. Results are presented in figures E-82 through E-85. Installation losses were less with the IEAFS installed than with the standard filter installed.

16. Installation losses in level flight with sideslip were determined in conjunction with the surveys of engine vibration and inlet distortion. Throughout the range of sideslip angles and power required, installation losses were less with the IEAFS installed than with the standard filter installed.

Low-Speed Flight

17. Installation losses in low-speed flight were determined in conjunction with the surveys of engine vibration and inlet distortion. Throughout the range of azimuths, airspeeds, and power required, installation losses were less with the IEAFS installed than with the standard filter installed.

Climb and Descent

18. Installation losses in climb and descent were determined in conjunction with the surveys of engine vibration and inlet distortion. Throughout the range of angles of attack, airspeeds, and power required, installation losses were less with the IEAFS installed than with the standard filter installed.

HANDLING QUALITIES

Static Lateral-Directional Stability

19. The static lateral-directional stability characteristics of the UH-1H with the IEAFS installed were evaluated at the conditions shown in table 3. Results are presented in figure E-86. The static lateral-directional stability of the UH-1H with the IEAFS installed is satisfactory and is essentially unchanged from that of the standard UH-1H.

Maneuvering Stability

20. Maneuvering stability was evaluated at the conditions shown in table 3 with the collective control fixed at the initial trim position. Results are presented in figure E-87. The maneuvering stability of the UH-1H with the IEAFS installed is satisfactory and is essentially unchanged from that of the standard UH-1H.

Low-Speed Flight

21. Low-speed flight characteristics were evaluated as described in appendix D at the conditions shown in table 3. Tests were conducted by flying the helicopter at a 10-foot skid height utilizing a ground pace vehicle for airspeed reference. The aircraft was flown at relative wind azimuths of zero to 330 degrees, in increments of 30 degrees measured clockwise from the nose of the aircraft. At each azimuth, the aircraft was flown at ground

speeds of five to 30 knots in 5-knot increments by keeping formation with the ground pace vehicle. True airspeed was therefore the algebraic sum of the pace vehicle speed and the component of the wind velocity in the direction of flight. For relative wind azimuths of 30, 120, 210, 240, and 270 degrees, the calculated true airspeed was greater than the 30-knot true airspeed allowed by the operator's manual. Handling quality ratings based on the HQRS were assigned based on a task tolerance of ±2 degrees heading and ±2 feet altitude. Results are presented in figures E-88 through E-100. At a 60-degree relative azimuth at airspeeds of approximately 20, 25, and 30 knots, full left pedal deflection was required to maintain heading, and frequent moderate longitudinal cyclic control was required to maintain pitch attitude (HQRS 7). The low-speed characteristics were unchanged from those of the standard UH-1H and remain a deficiency as previously reported (ref 11, app A).

Simulated Engine Failure

22. Simulated engine failures were qualitatively evaluated in level flight with the IEAFS installed. The aircraft was stabilized in level flight and engine failure was simulated by rapidly moving the throttle to the flight idle detent. Controls were held fixed until activation of the low main rotor speed audio warning. No change in response or handling qualities compared to a standard UH-1H were observed.

RELIABILITY AND MAINTAINABILITY

General

23. The reliability and maintainability of the IEAFS were evaluated throughout the evaluation. The IEAFS installed on the aircraft was a prototype. It was inspected before and after each flight. During the first two test flights, the IEAFS upper assembly was removed after each flight to allow inspection of the engine inlet installation.

Latch Lever Attachment

24. During the second installation of the IEAFS upper assembly, the left rear latch lever separated from the assembly. This separation was caused by failure of the two aluminum attaching rivets (fig. 1). During further inspection, it was determined that the right rear latch lever was loose. This looseness was caused by deformation of the three aluminum attaching rivets. This lever and the remaining ones were removed and reinstalled by AEFA personnel using steel-core rivets. No latch lever failures occurred during the remainder of the evaluation. The poor reliability of the latch lever attachment is a deficiency and should be corrected before production.

Latch Lever Locking Device

25. The upper assembly latch levers included a sliding spring-loaded positive locking device (fig. 2). This device was designed to prevent inadvertent release of the latch. In several instances during preflight inspection, the latch appeared to be locked, but a relatively small outward force on the lower potion of the latch lever would cause it to release. This was caused by two factors: (1) the spring was too weak, and (2) when being closed, the latch lever struck the IEAFS lower assembly, preventing the latch from

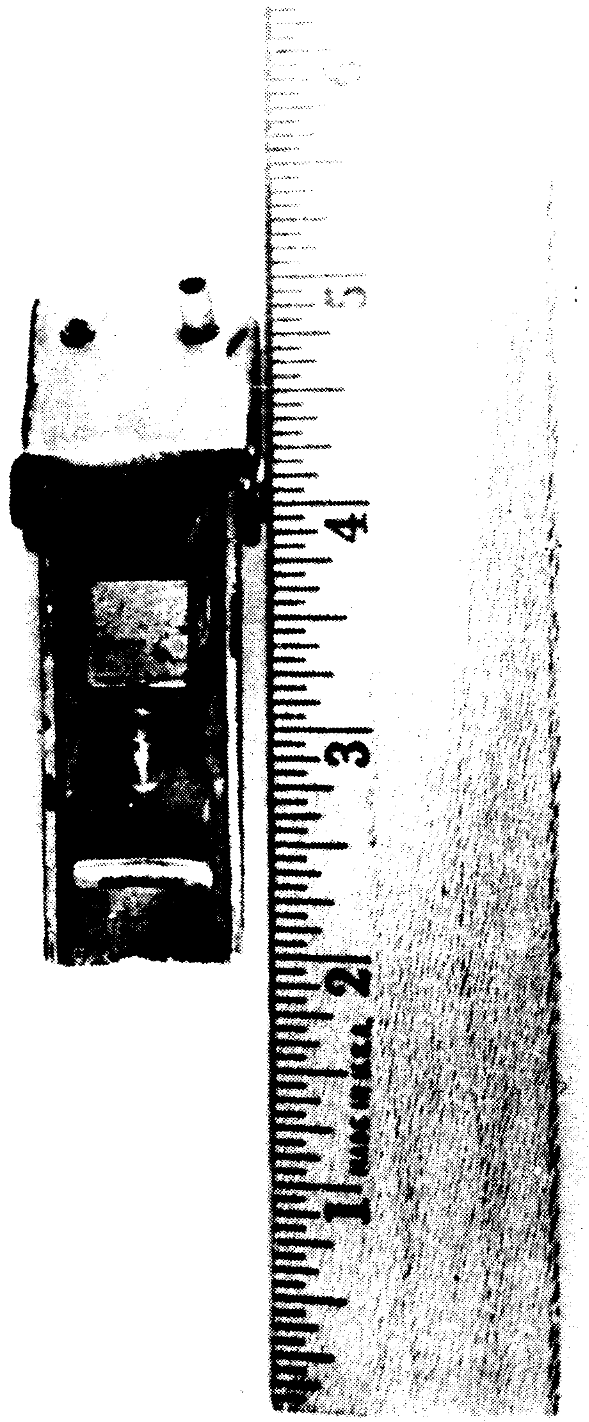

Figure 1. Failed Aluminum Attaching Rivets in IEAFS Latch Lever

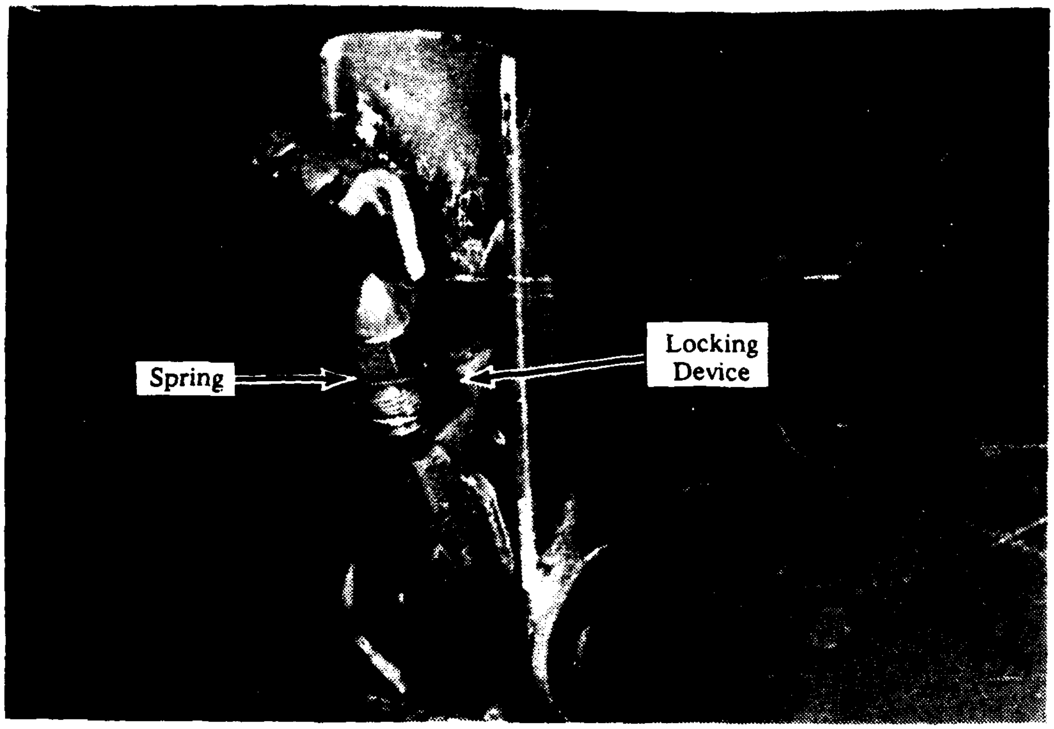

Figure 2. Locking Device and Spring in IEAFS Latch Lever

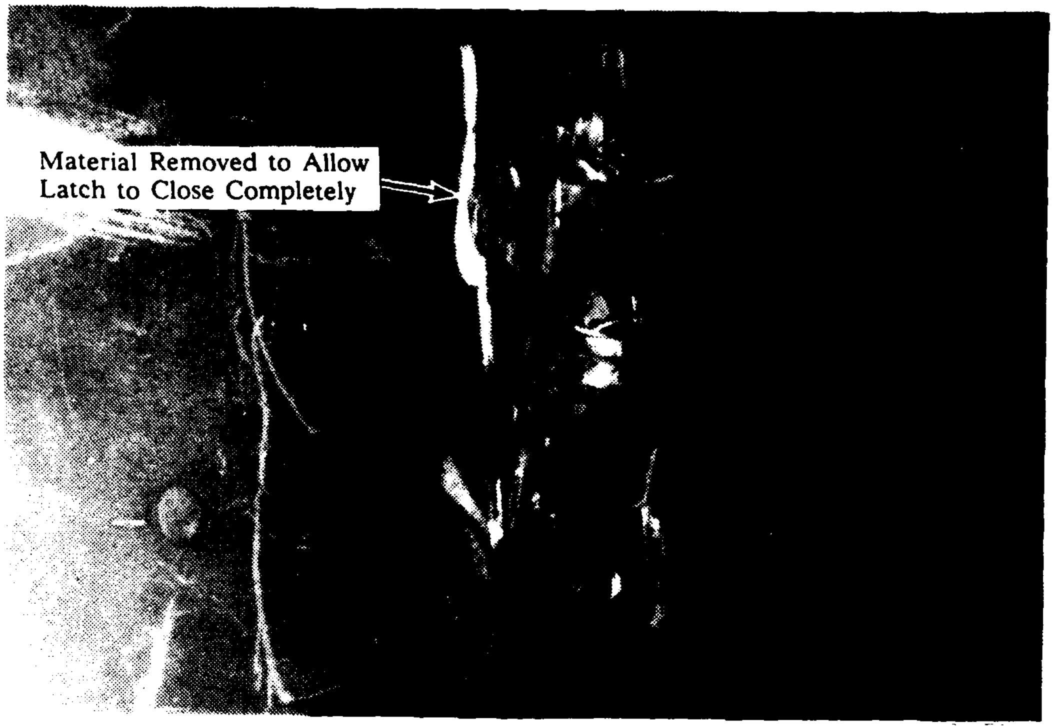

Figure 3. IEAFS Latch Lever with Material Removed to Allow Complete Closure

being completely closed. The locking device moved smoothly only if the latch lever was completely closed. The combination of inadequate spring force and increased friction between the locking device and the latch lever prevented full travel of the locking device. The problem was partially corrected by removing a portion of the latch lever as shown in figure 3. This allowed the latch lever to close completely; however, the spring force was still inadequate to ensure full travel of the locking device. Manual assistance was often required to obtain full travel. The poor reliability of the locking device is a shortcoming which should be corrected before production.

CONCLUSIONS

GENERAL

26. Aircraft hover and level flight power required of the UH-1H with the IEAFS installed are not significantly different from those with the standard filter installed (paras 7 and 8).

27. Engine vibrations with the IEAFS installed are unchanged from those with the standard filter installed (para 10).

28. Inlet distortions with the IEAFS installed are less than with the standard filter installed (para 11).

29. Engine installation losses of the UH-1H with the IEAFS installed are less than with the standard filter installed (paras 13 through 18).

30. The handling qualities of the UH-1H with the IEAFS installed are essentially unchanged from those of the standard UH-1H (paras 19 through 22).

31. One deficiency and one shortcoming of the IEAFS installation in the UH-1H have been identified during this evaluation (paras 24 and 25).

DEFICIENCY

32. The poor reliability of the IEAFS latch lever attachment is a deficiency (para 24).

SHORTCOMING

33. The poor reliability of the IEAFS latch lever locking device is a shortcoming (para 25).

RECOMMENDATIONS

34. The following recommendations are made:

a. The deficiency identified in paragraph 32 should be corrected before production (para 24).

b. The shortcoming identified in paragraph 33 should be corrected before production (para 25).

APPENDIX A. REFERENCES

1. Letter, AVSCOM, AMSAV-8, 24 October 1986, subject: Airworthiness and Flight Characteristics of the Improved Engine Air Filtration System on the UH-1H Helicopter, AEFA Project No. 86-16. (Test Request)

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6. Letter, AVSCOM, AMSAV-E, 11 May 1987 with Revision 1, dated 28 July 1987, subject: Airworthiness Release for UH-1H Helicopter with Improved Engine Air Filtration System Installed, (AEFA Project No. 86-16).

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8. Engineering Design Handbook, Headquarters, US Army Material Command, AMCP, 706-204, *Helicopter Stability and Control (Preliminary Edition)*, November 1983.

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10. Model Specification, Lycoming Division, AVCO Corporation, Specification No. 104.33, *T53-L-13/T53-L-13A/T53-L-13B Shaft Turbine Engines*, 30 September 1964, last revised 30 September 1969.

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APPENDIX B. DESCRIPTION

GENERAL

1. The UH-1H is a thirteen-place, single-engine, single-main-rotor helicopter, with a two-bladed teetering rotor and a two-bladed tail rotor. The maximum gross weight of the helicopter is 9500 pounds. Power is provided by a Lycoming T53-L-13B free turbine engine rated at 1400 shaft horsepower (shp) uninstalled at sea level standard day conditions. The main transmission is limited to 1137 shp for continuous operation. The helicopter used in this evaluation, USA S/N 69-15532, manufactured by BHTI, is a production UH-1H modified to incorporate test instrumentation, a main rotor brake, and the IEAFS. Figures B-1 through B-8 show the helicopter with the IEAFS installed. Figure B-9 is a close-up of the IEAFS installed on the helicopter.

STANDARD FILTER

2. The standard filter installed on UH-1H helicopters serial no. 68-15779 and subsequent is an inertial self-purging particle separator. Particle-laden air is directed through a large annular chamber and through an air cleaner. A constant supply of bleed air from the engine flows through the venturi-type ejector and carries particles overboard through airframe plumbing.

IMPROVED ENGINE AIR FILTRATION SYSTEM

3. The IEAFS is a self-purging particle separator air induction system. The air particle separator is an inertial type system consisting of upper and lower assembly halves, shown in figures B-10 through B-16, compressor bleed hose and fitting, and attaching hardware. It incorporates a compressor wash kit, and the upper assembly half is covered with a screen, as shown in figures B-12 through B-14, permitting personnel to stand on top of the IEAFS during maintenance operations.

4. The basic functional element of the IEAFS is the vortex generator tube, shown in figures B-17 through B-19. The upper assembly half contains the vortex generator tubes, as shown in figures B-12, B-15, and B-16. Incoming air is rotated so that solid particles are centrifuged to the wall of the vortex tube, swept into the scavenge space, and passed into the cavity between the inlet and outlet plate. Cleaned air passes through the vortex outlet tubes to the engine. Dust inside the air cleaner is scavenged overboard through the rear left-hand and right-hand vertical slots. Bleed air from the engine is used to eject the separated dust particles through the vertical slots.

5. The IEAFS is designed to replace the standard filter, but the system is designed to allow reinstallation of the standard filter. The installation of the IEAFS requires the following modifications:

Remove differential pressure switch from firewall and cut, cap, and tie back wire from switch.

Drill new hole in firewall and rivet IEAFS adapter kit to firewall.

Figure B-1. Test Aircraft-Front View

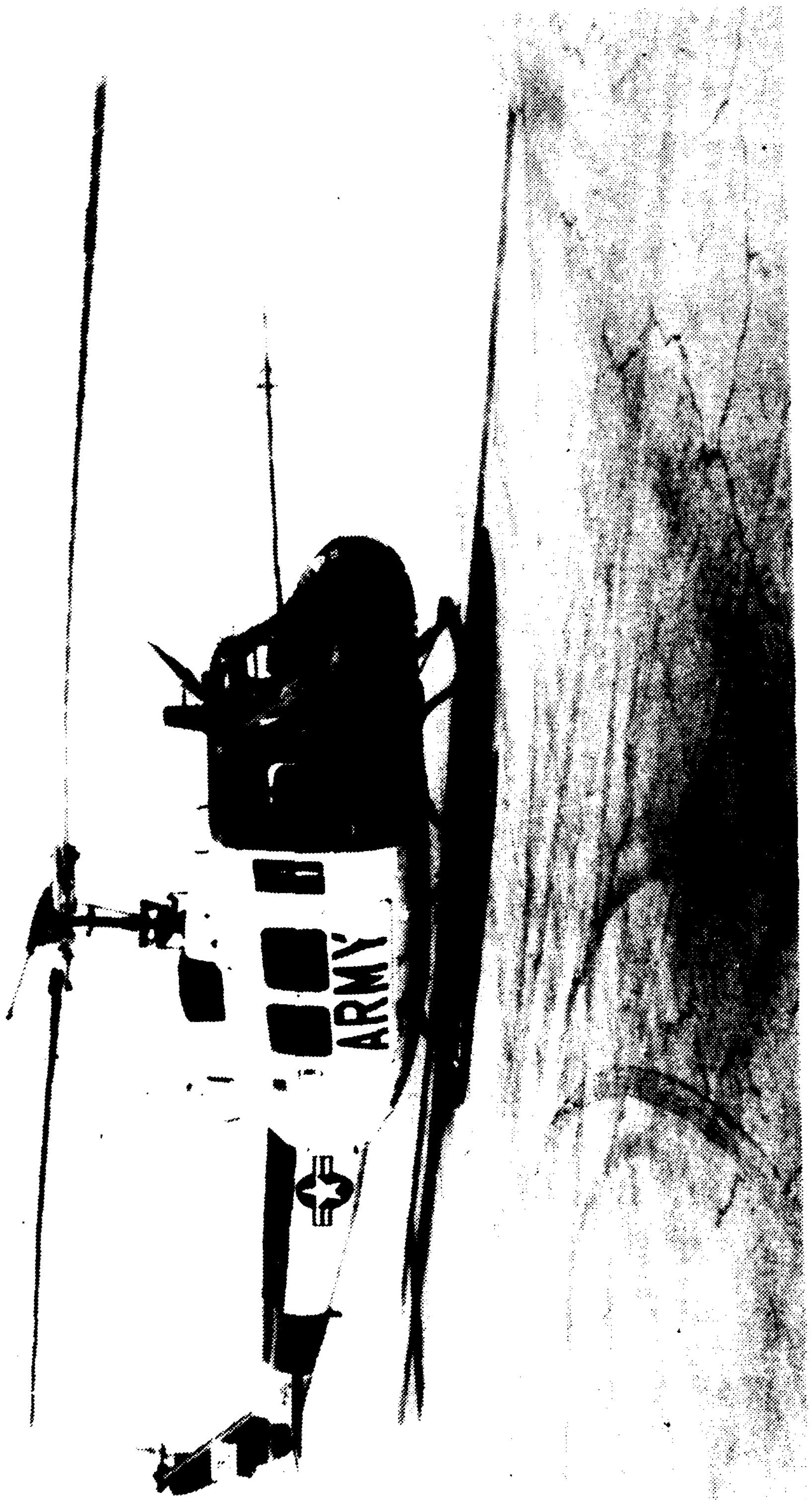


Figure B-2. Test Aircraft-Right Front Quarter View

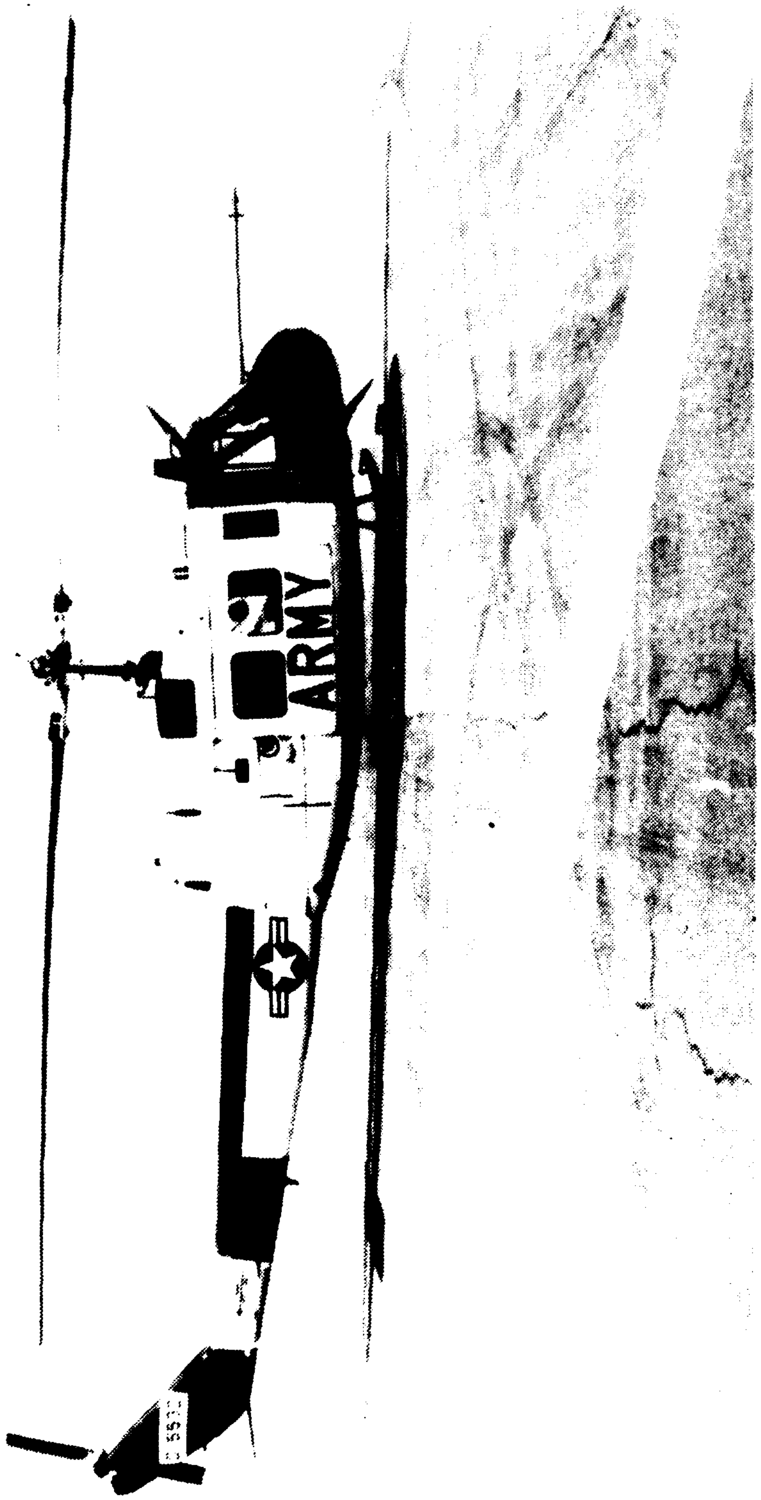


Figure B-3. Test Aircraft-Right Side View

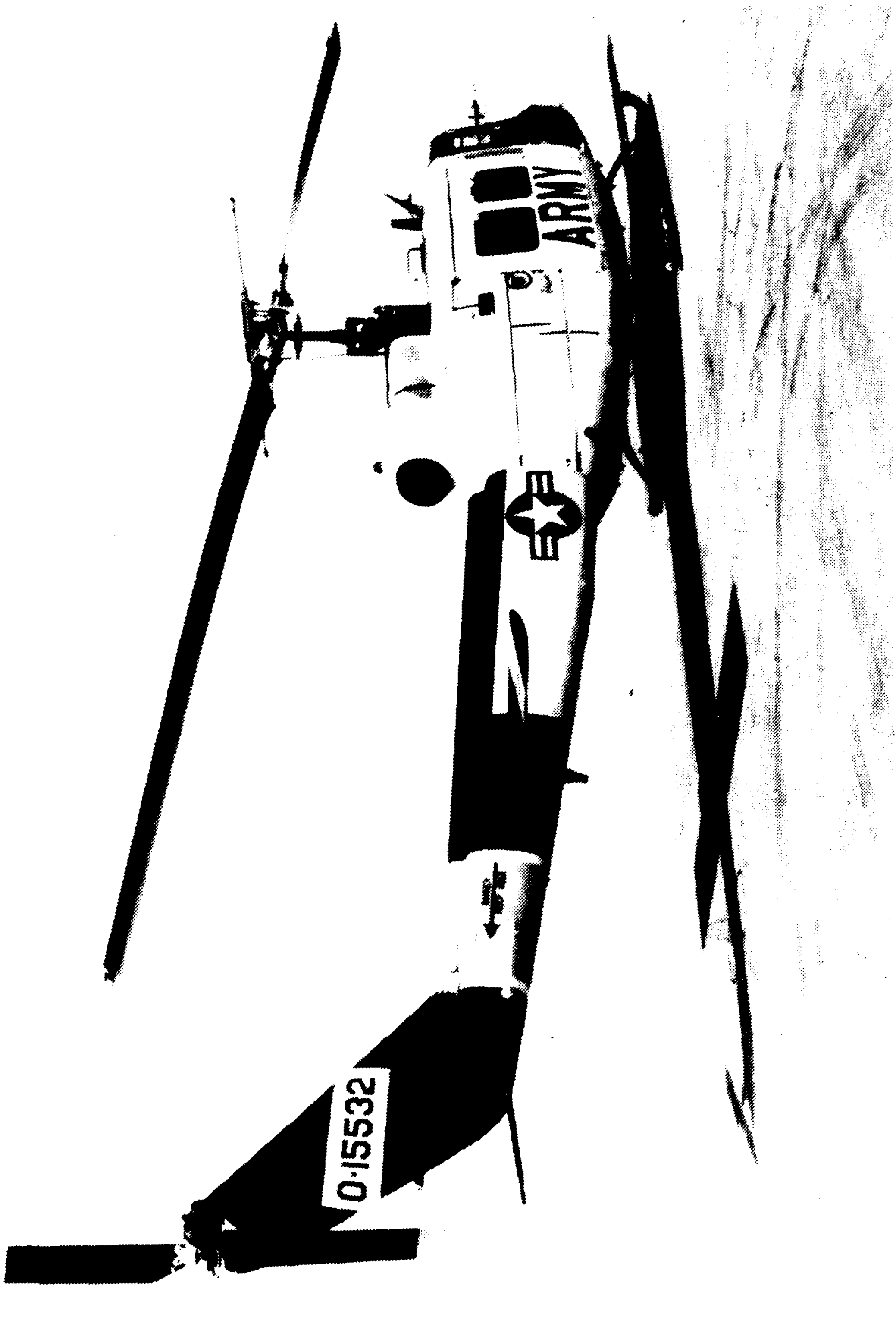


Figure B-4. Test Aircraft–Right Rear Quarter View

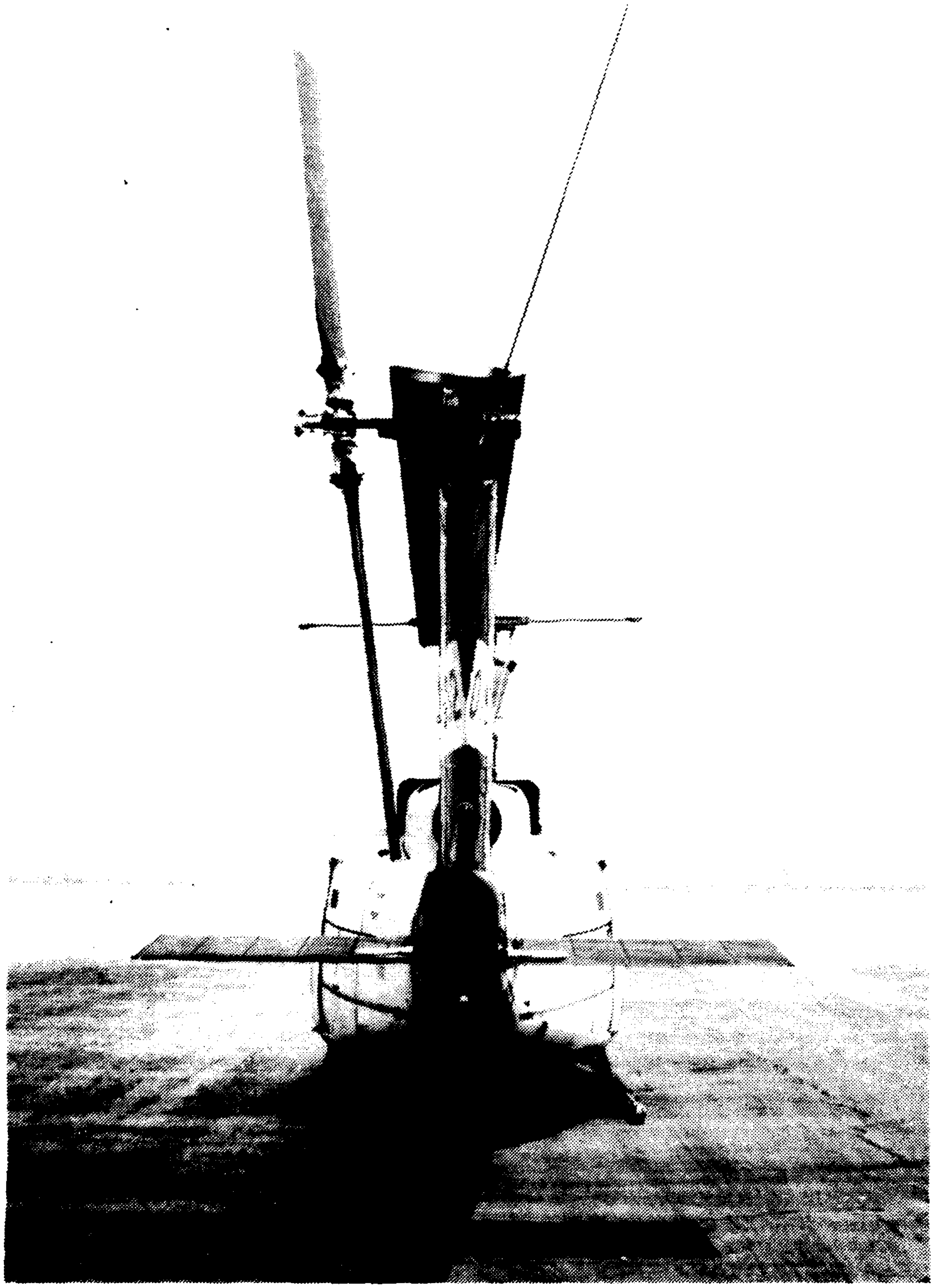


Figure B-5. Test Aircraft-Rear View

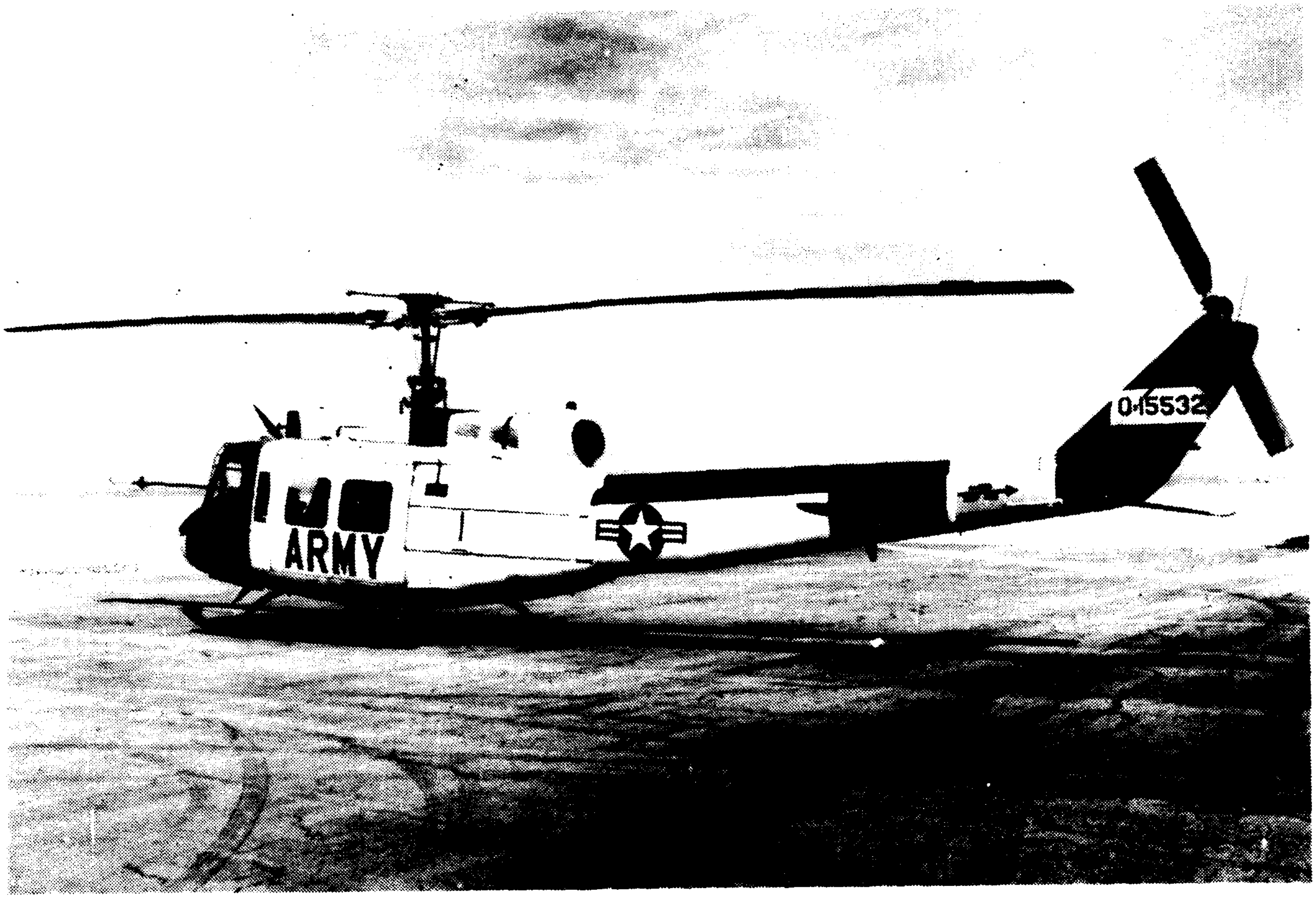


Figure B-6. Test Aircraft-Left Rear Quarter View

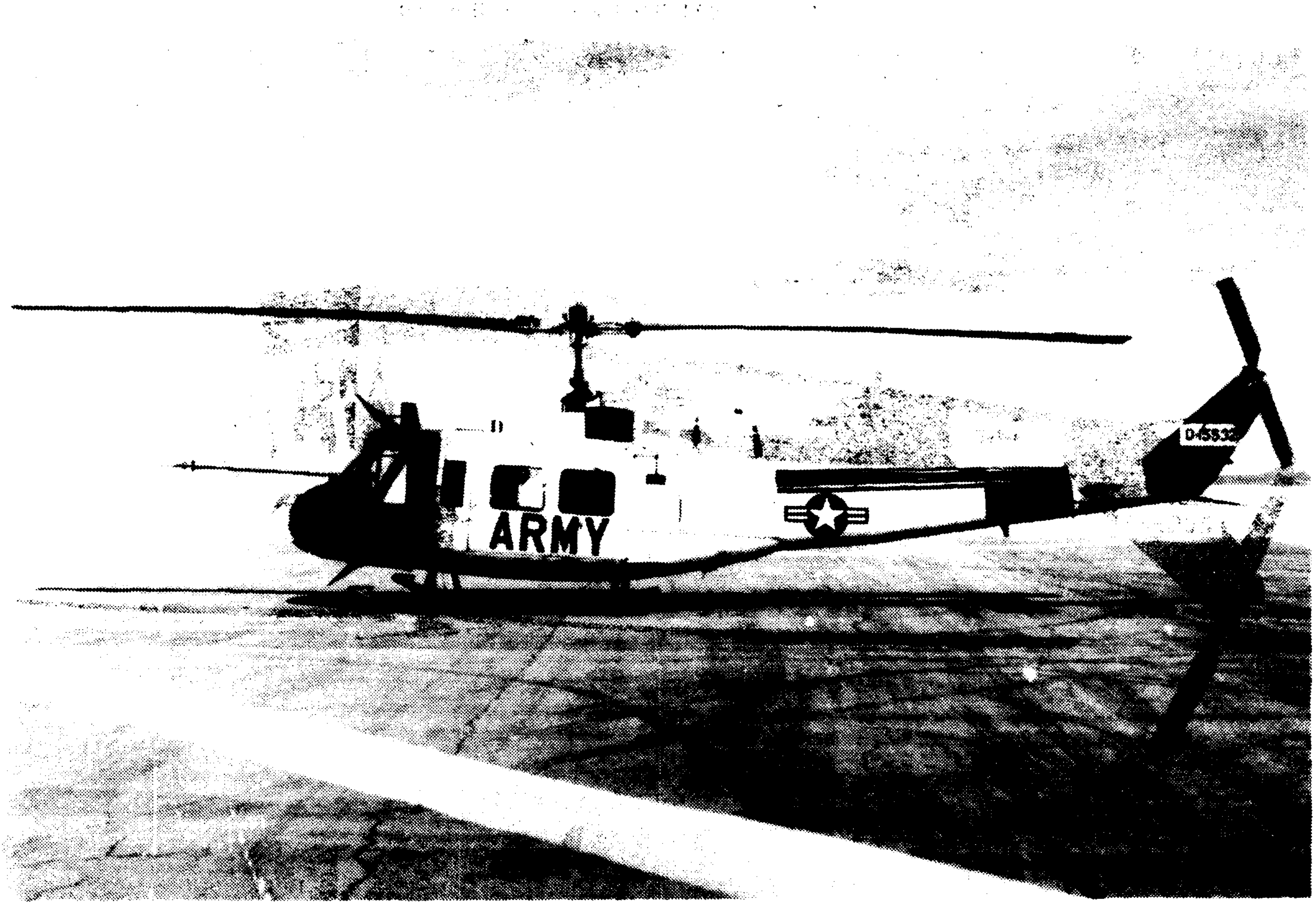


Figure B-7. Test Aircraft–Left Side View

Figure B-8. Test Aircraft-Left Front Quarter View

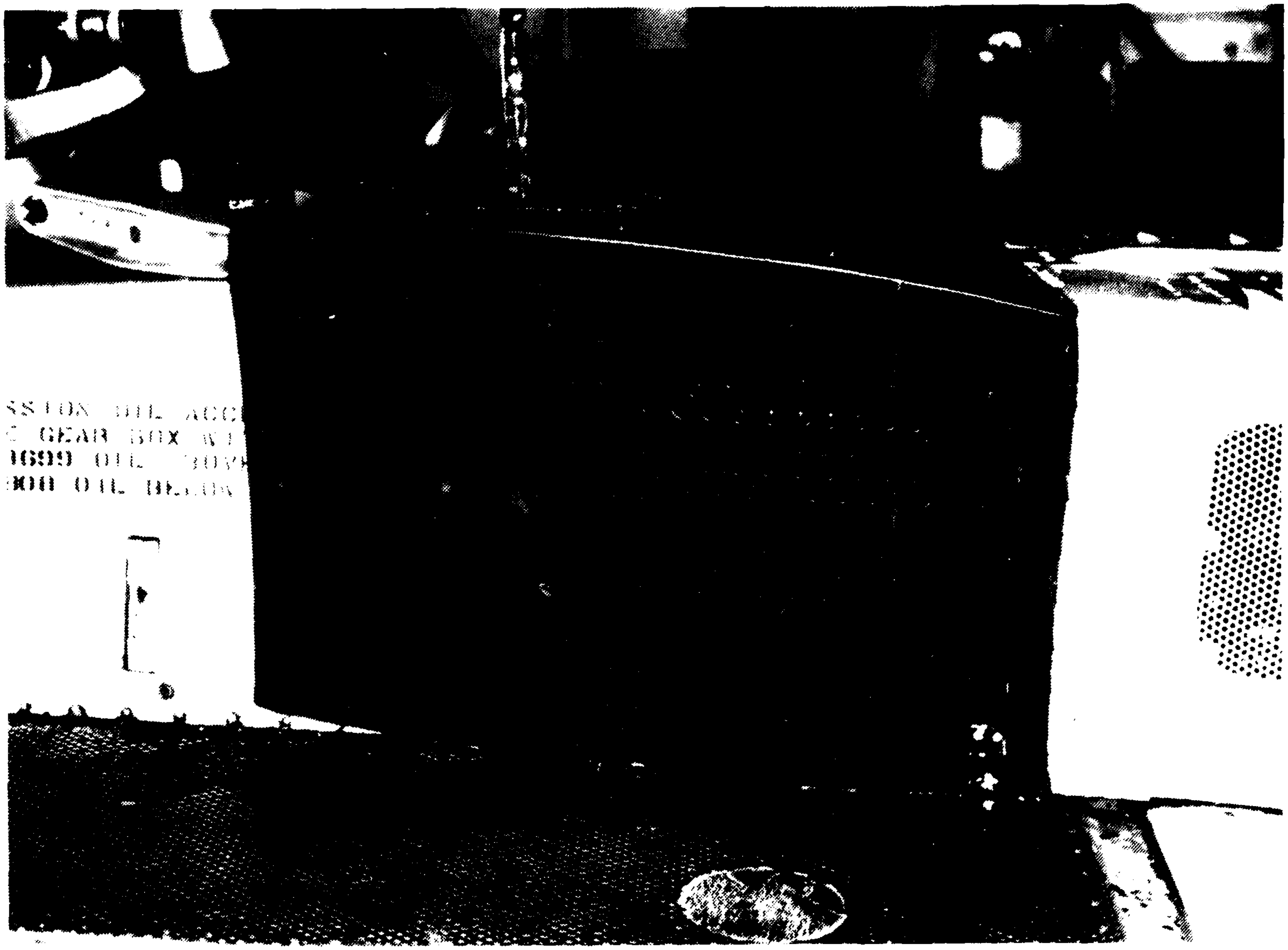


Figure B-9. IEAFS Installed on Aircraft–Left Side View

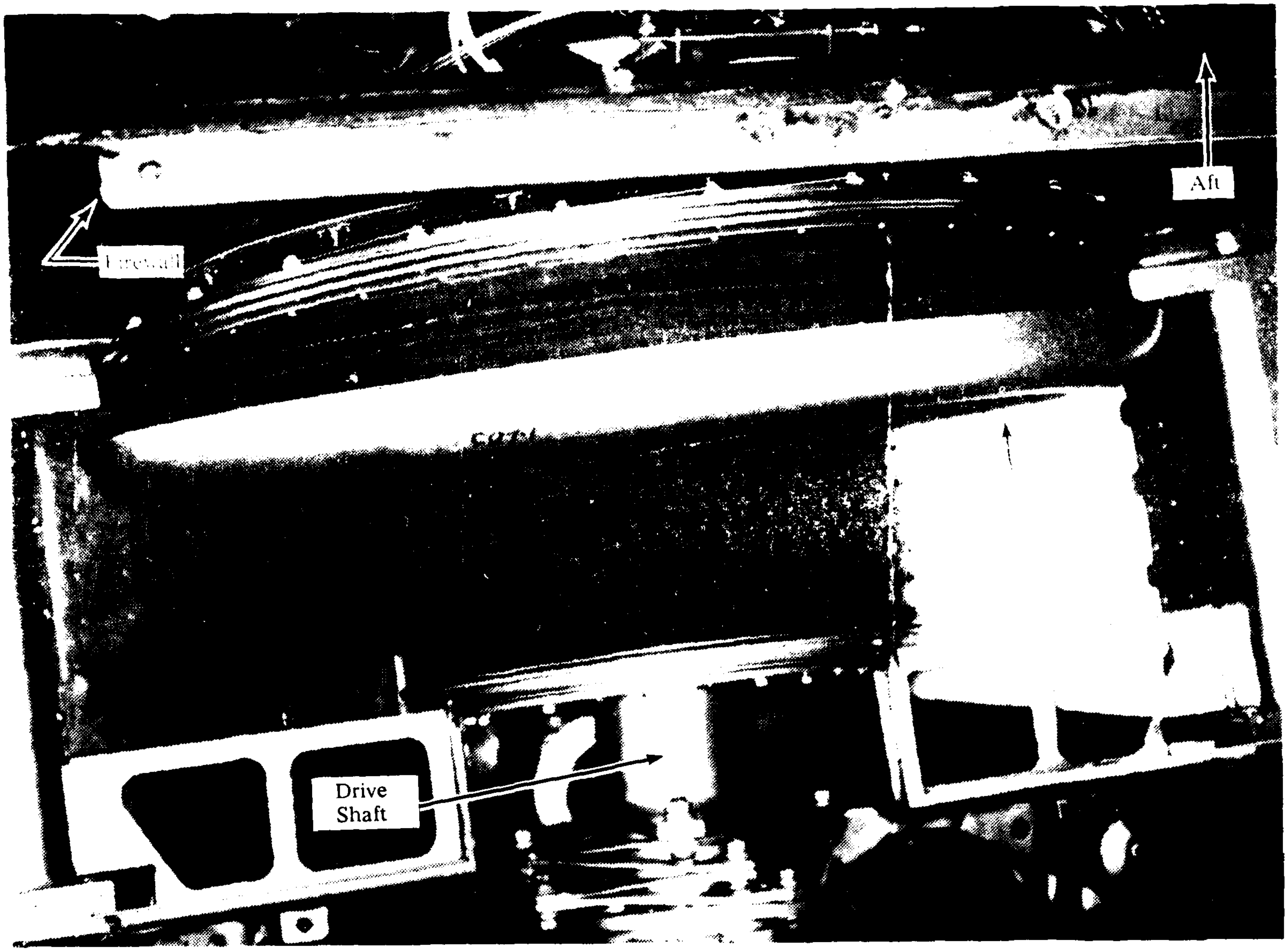


Figure B-10. Lower Half of IEAFS, Installed in Test Aircraft–Vertical View Looking Down

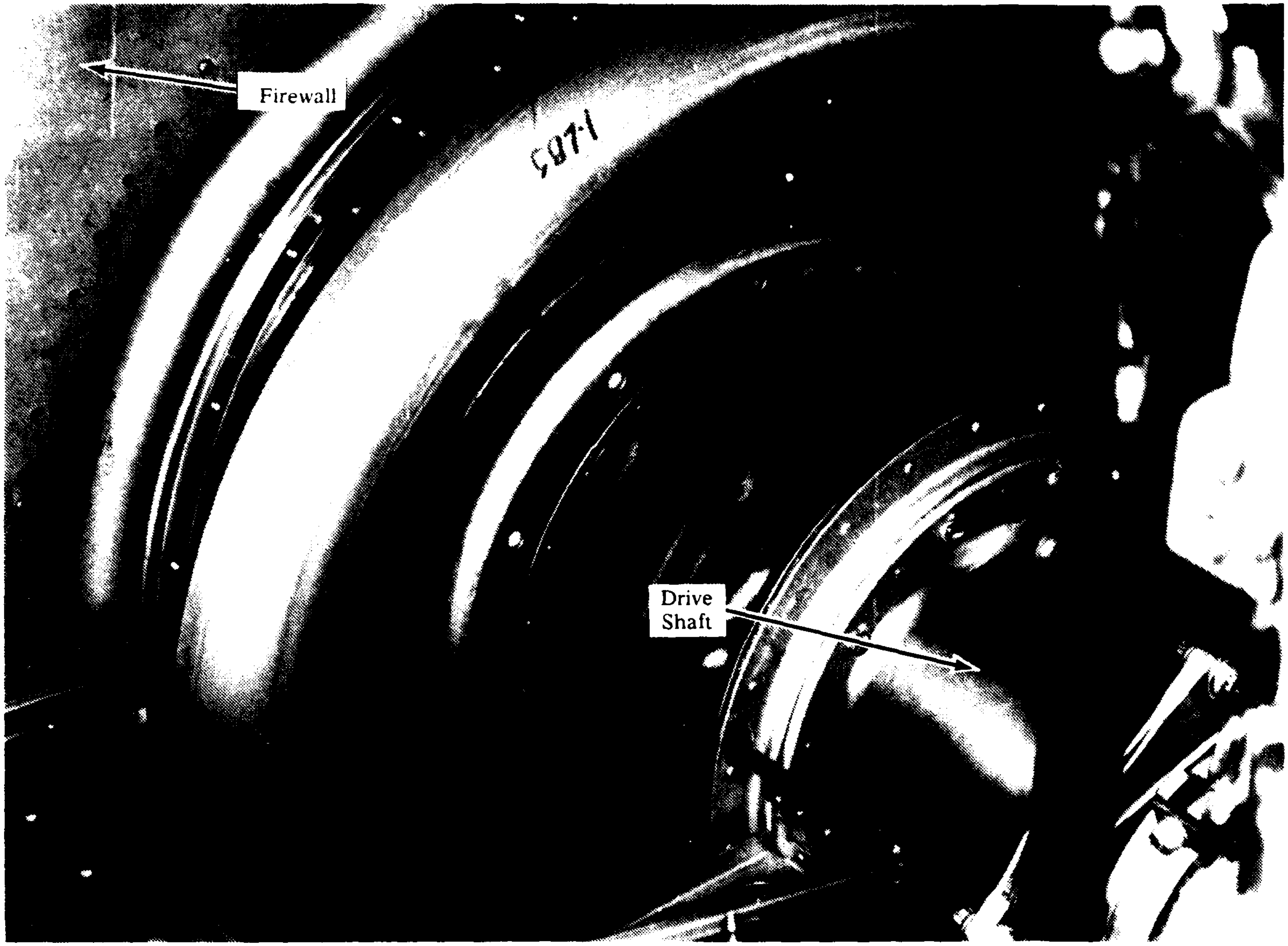


Figure B-11. Air Intake in IEAFS Lower Half-Right Front Quarter View

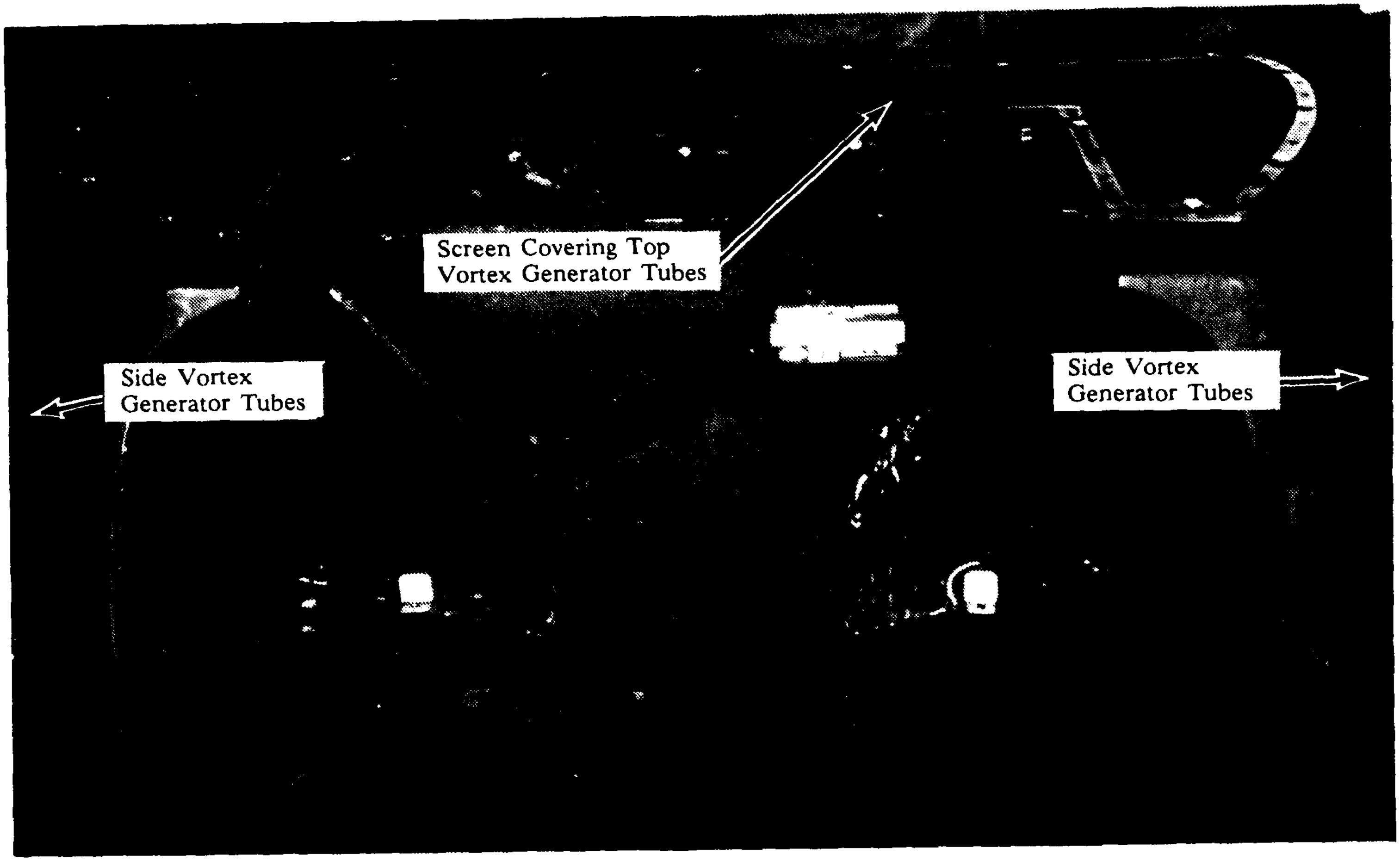


Figure B-12. IEAFS Upper Half-Front View

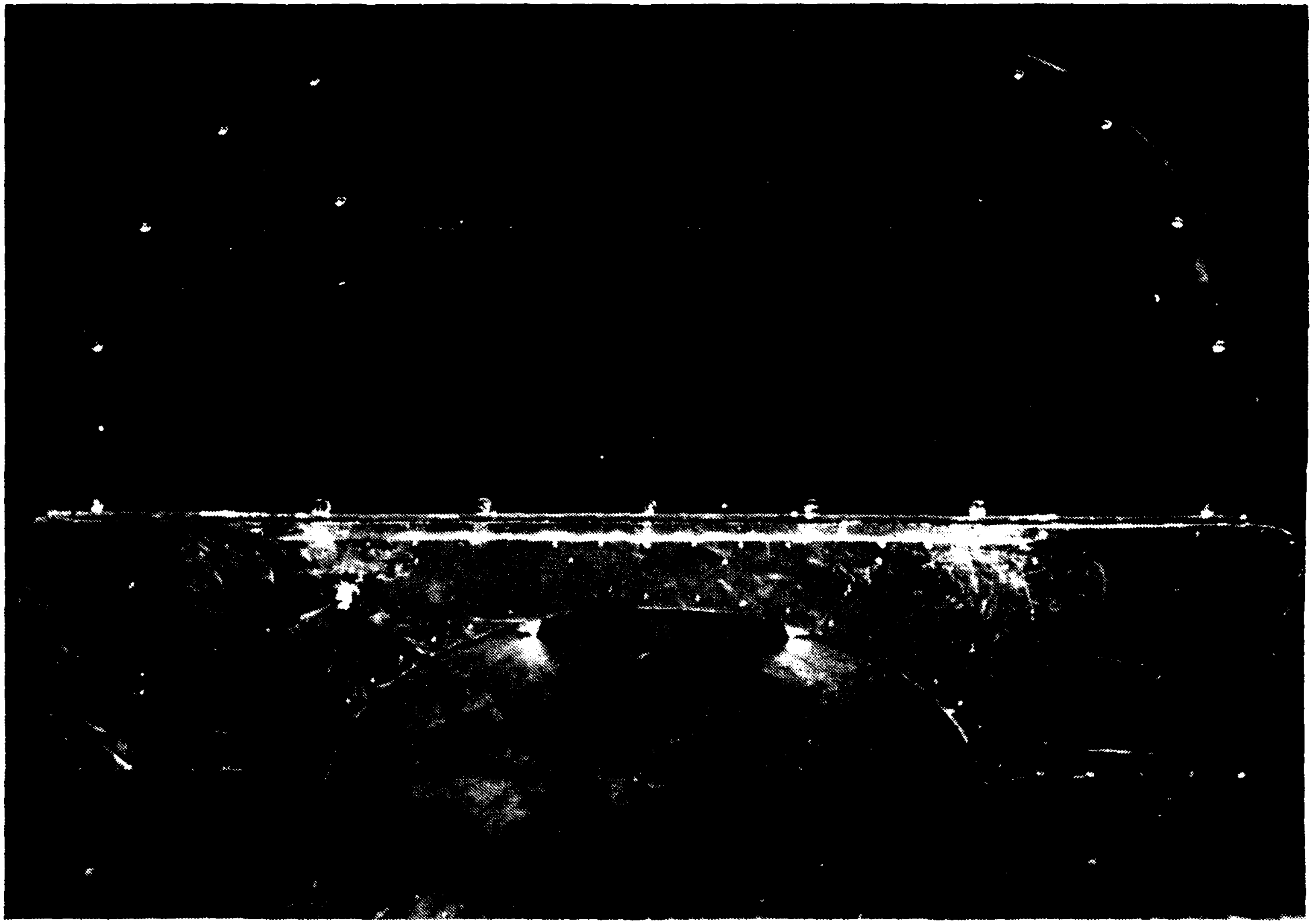


Figure B-13. IEAFS Upper Half-Rear View

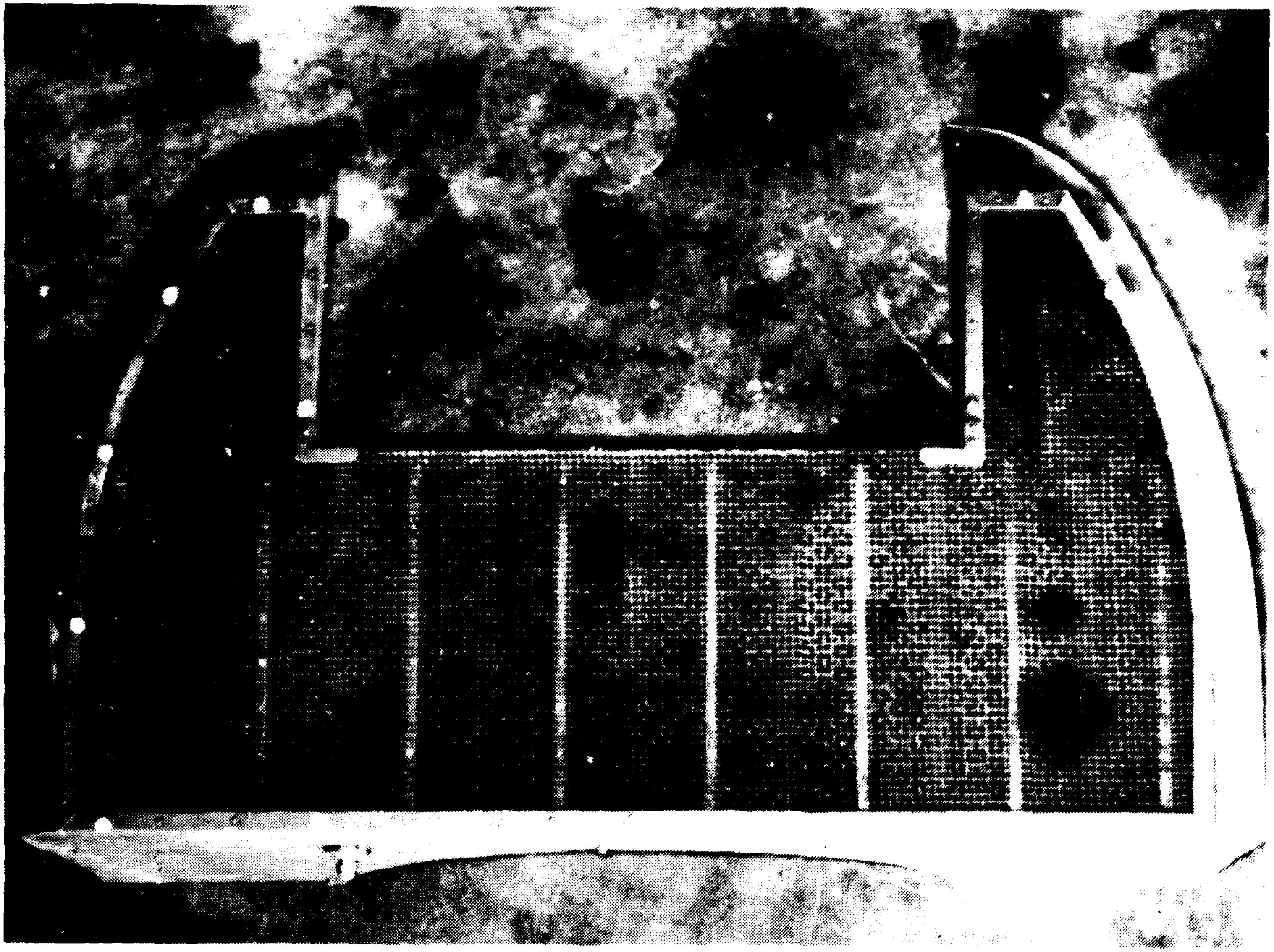


Figure B-14. IEAFS Upper Half-Vertical View Looking Down

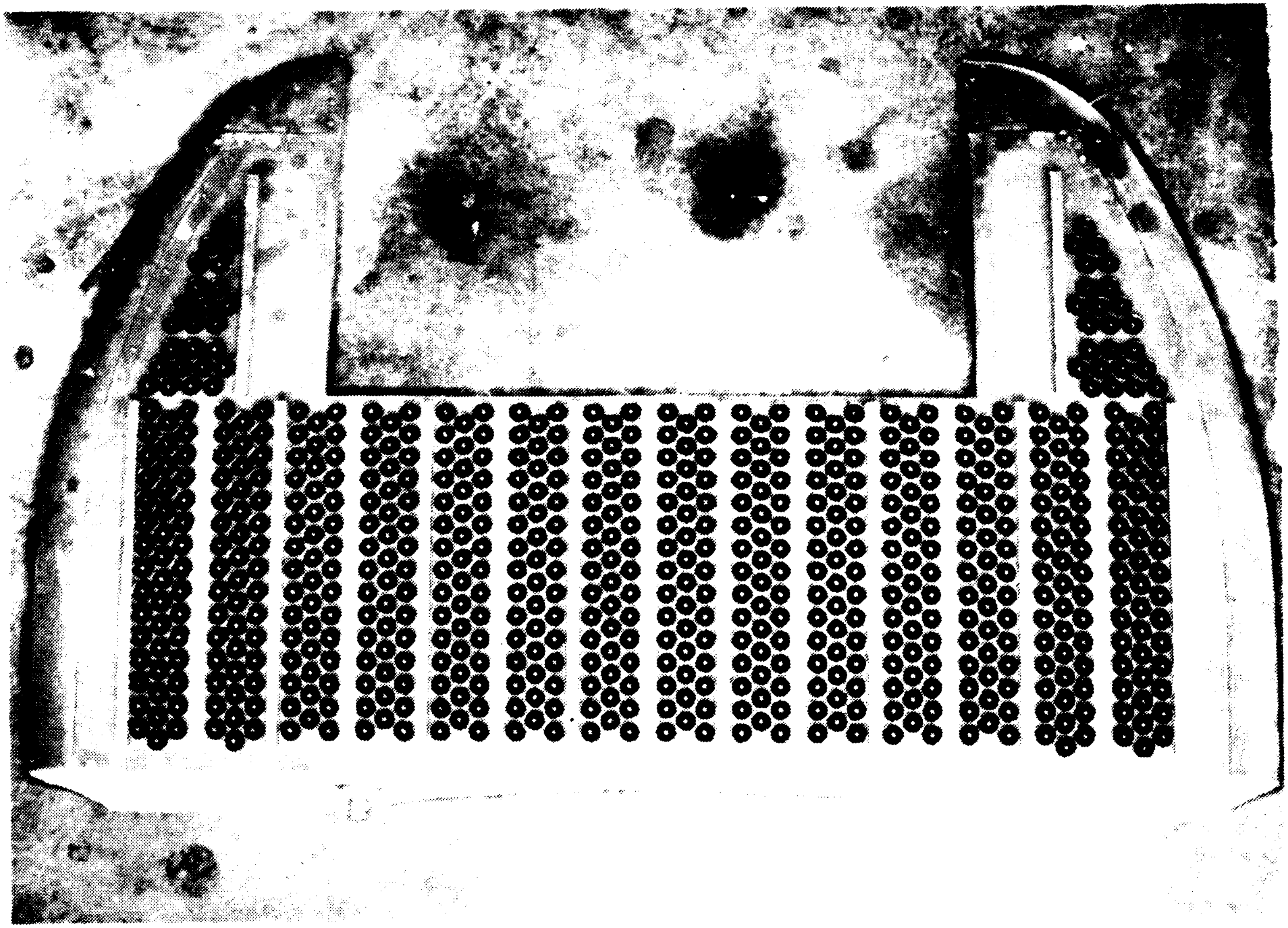


Figure B-15. IEAFS Upper Half with Screen Removed–Vertical View Looking Down

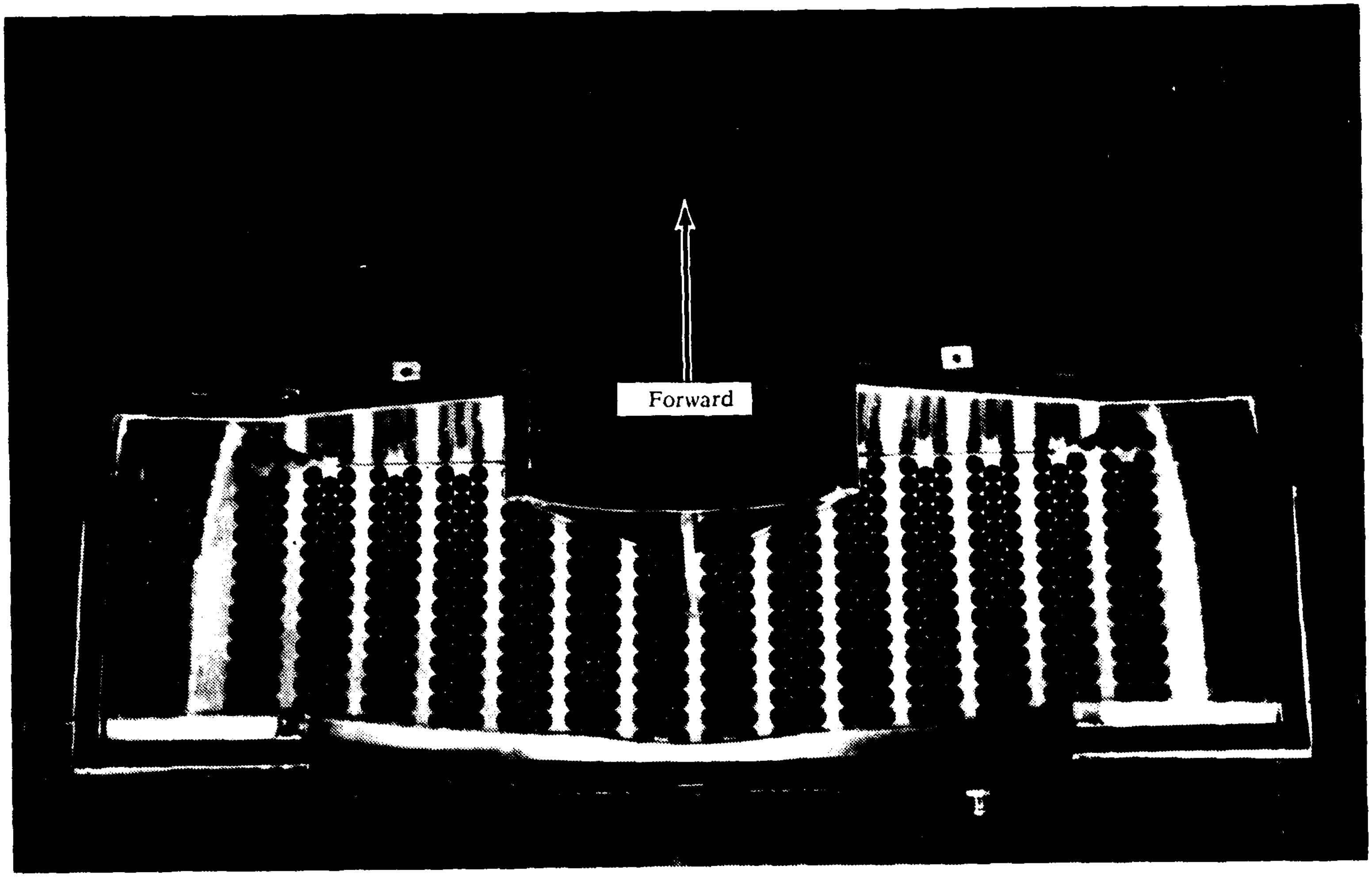


Figure B-16. Inside of IEAFS Upper Half Showing Downstream Ends of Vortex Generator Tubes

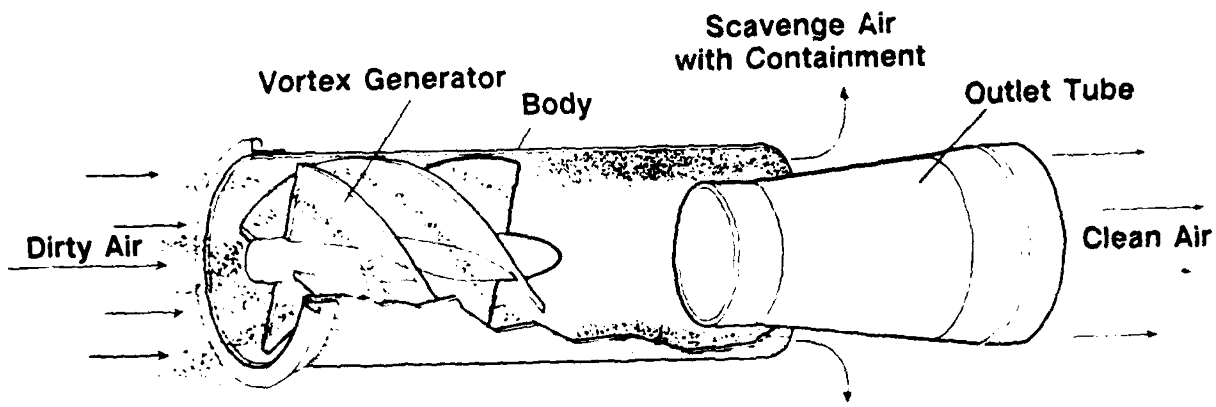


Figure B-17. Vortex Generator Tube

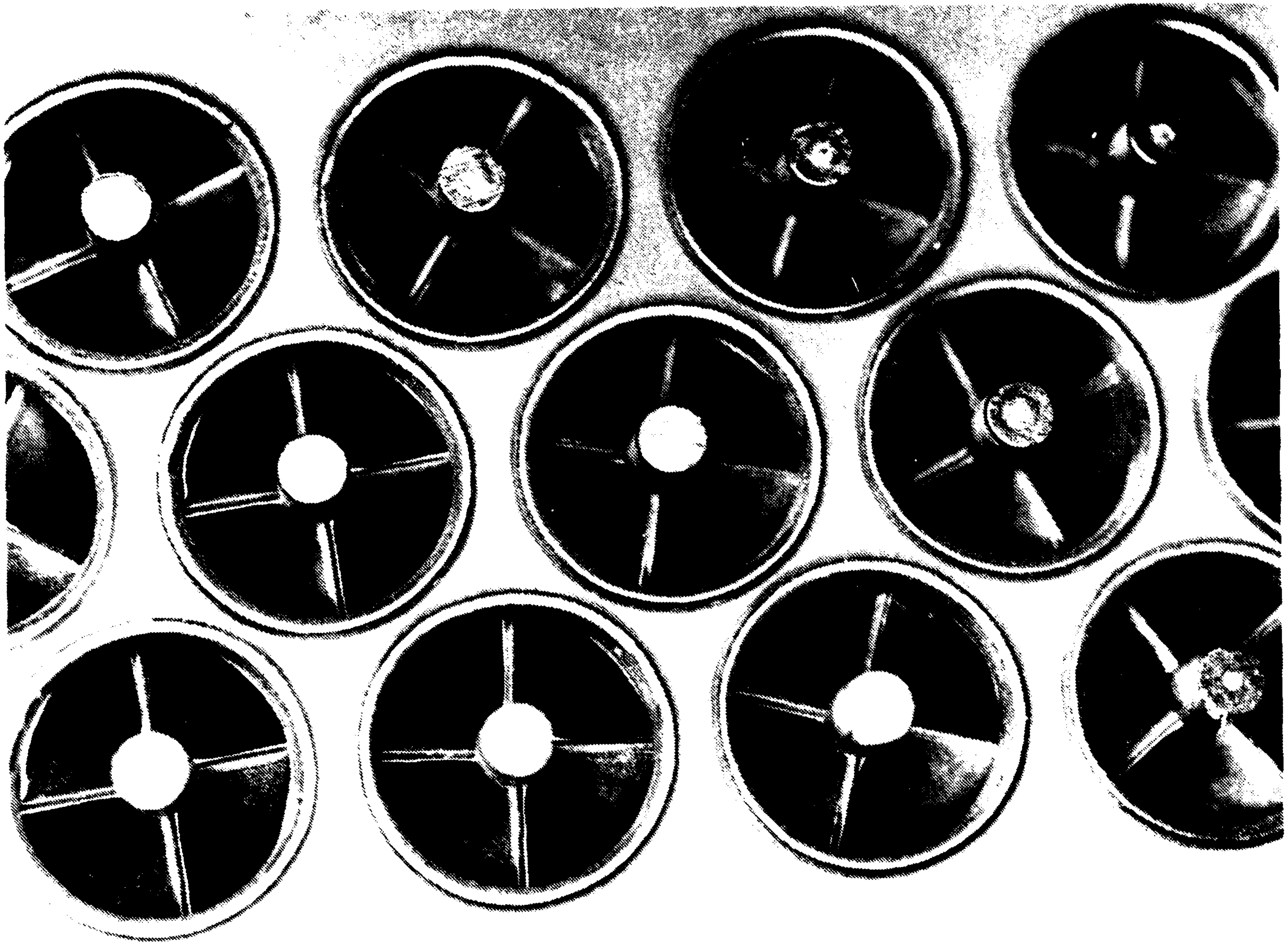


Figure B-18. Vortex Generator Tubes Installed in IEAFS. View from Outside of IEAFS Showing Upstream Ends of Tubes

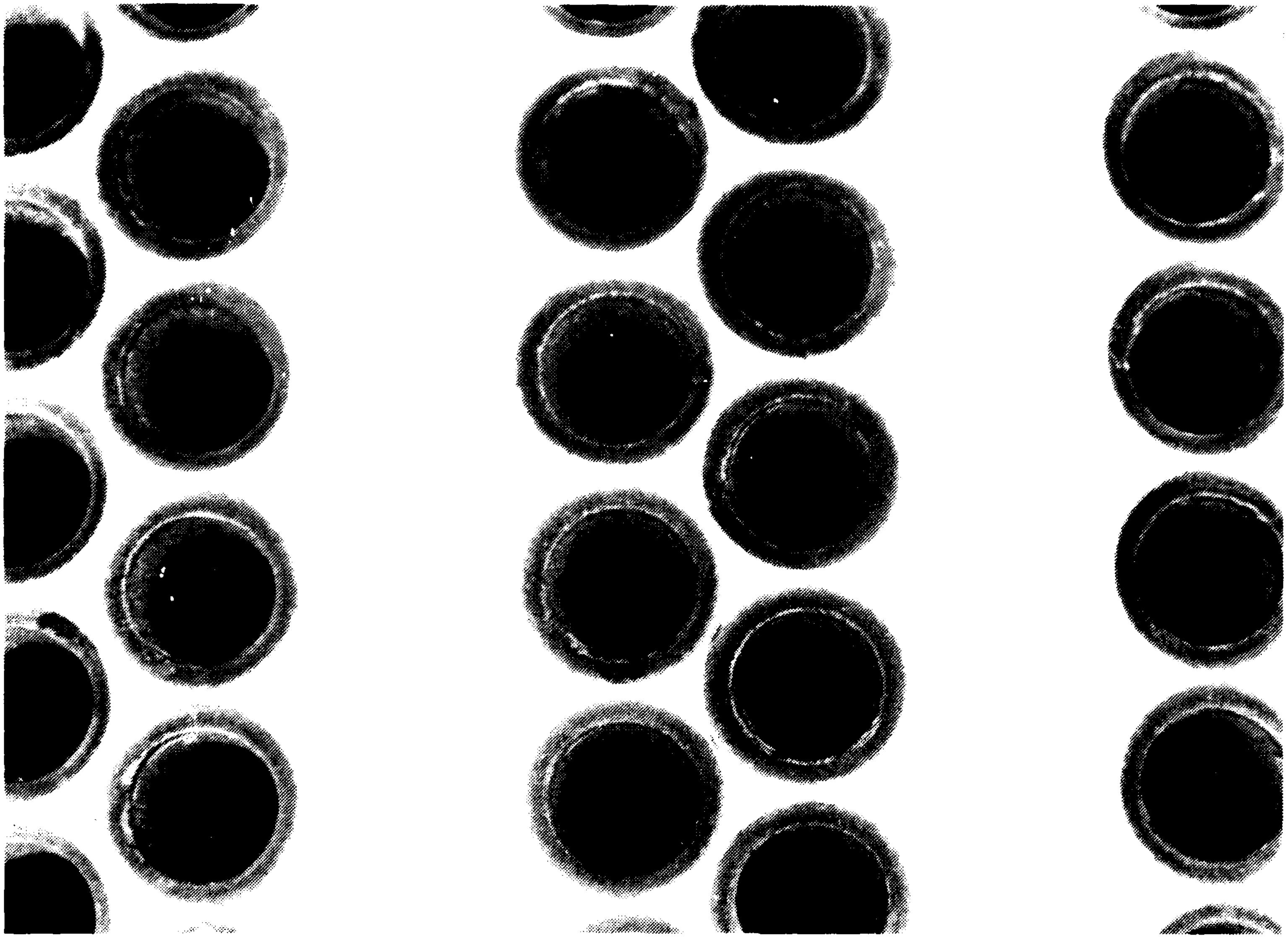


Figure B-19. Vortex Generator Tubes Installed in IEAFS. View from Inside of IEAFS Showing Downstream Ends of Tubes.

Remove four quarter-turn fastener receptacles by drilling out two rivets in each receptacle, and install four IEAFS nutplate adapters by installing rivets through same rivet holes.

FLIGHT ENVELOPE

6. The JUH-1H with the IEAFS installed was cleared for flight within the flight envelope specified in the operator's manual (ref 3, app A) and the airworthiness release (ref 6).

APPENDIX C. INSTRUMENTATION

GENERAL

1. The airborne data acquisition system was installed, calibrated and maintained by AEFA personnel. The system used pulse code modulation (PCM) encoding for standard handling qualities, performance, and inlet distortion data. Magnetic tape was used to record data on board the aircraft. A test instrumentation boom was mounted at the base of the aircraft windshield and extended forward 9.5 feet. A swiveling pitot-static tube and angle of attack and sideslip vanes were mounted on the boom. Engine inlet temperature data was obtained from six thermocouples installed in a standard UH-1H engine bellmouth. Engine inlet pressure was measured using an electronic pressure scanner which sequentially sampled the pressure of 48 pressure ports installed in a standard UH-1H engine bellmouth. Engine vibration was measured using three accelerometers mounted on the engine. Instrumentation and related special equipment installed in the aircraft and used for this test are:

Pilot's Panel

Airspeed (boom)
Pressure altitude (boom)
Radar altimeter
Angle of sideslip
Main rotor speed
Gas producer speed*
Turbine gas temperature*
Engine torque
Fuel remaining*
Cable angles
Collective control position
Instantaneous vertical speed indicator*

Copilot's Panel

Airspeed (standard system)
Pressure altitude (standard system)
Fuel quantity used
Total air temperature
Cable tension
Record number

Center Console

Reference time of day

Magnetic Tape

Record number
Time of day
Airspeed (boom)
Airspeed (ship)

Pressure altitude (boom)
Pressure altitude (ship)
Radar altitude
Angle of sideslip
Control positions
- Longitudinal
- Lateral
- Directional
- Collective

Aircraft Attitudes
- Roll
- Pitch
- Heading

Aircraft Rates
- Roll
- Pitch
- Yaw

Acceleration (three linear accelerometers at aircraft center of gravity)
Fuel flow
Fuel quantity used
Free air total temperature
Main rotor speed
Cable tension
Cable angles
Engine vibration (3 accelerometers, 400 Hertz response)
Engine compressor discharge pressure
Engine torque
Engine gas producer speed
Engine turbine gas temperature
Throttle position
Engine inlet guide vane position
Engine bleed band position
Engine inlet air temperature (6)
Engine inlet air differential pressure (48)
Transmission housing static pressure

*Indicates standard ship indicator

Pitot-Static Calibration

2. The results of the test boom airspeed system calibration performed for AEFA Project No. 84-25 were used for this evaluation. The position error correction for the test boom airspeed system is presented in figure C-1. The altimeter position error was calculated assuming all airspeed position error occurred at the static source.

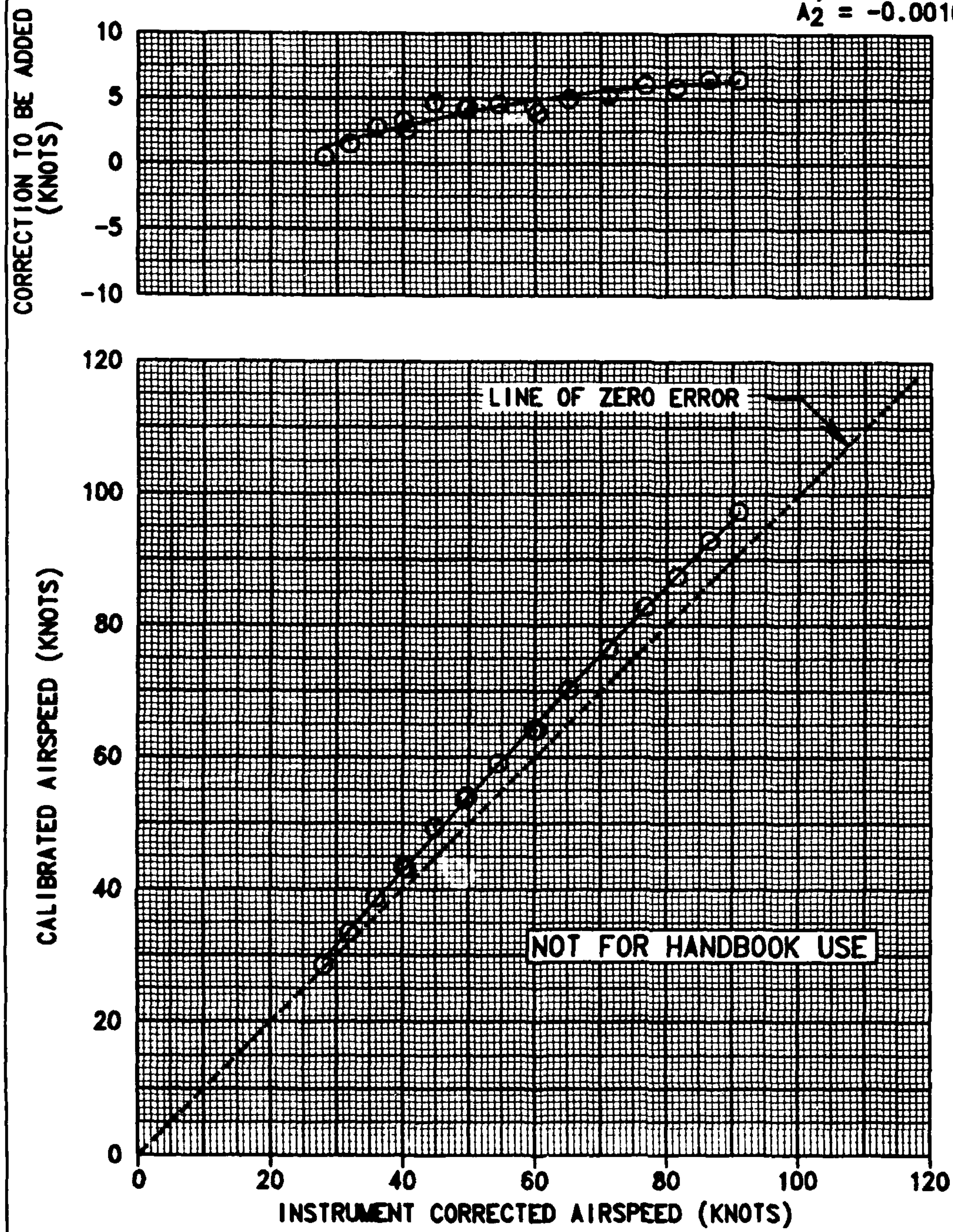
FIGURE C-1

BOOM AIRSPEED CALIBRATION

SWIVELING PROBE
UH-1H USA S/N 69-15532

DENSITY ALTITUDE (FT)	OAT (DEG C)	ROTOR SPEED (RPM)	FLIGHT CONDITION	METHOD
9870	19.5	324	LEVEL	TRAILING BOMB

DELTA V = $A_0 + A_1 \times VICB + A_2 \times VICB^2$, WHERE: $A_0 = -3.828491$
$A_1 = 0.2110640$
$A_2 = -0.001097184$



Engine Calibration

3. The engine was calibrated in a test cell at the Corpus Christi Army Depot before commencement of the evaluation. The following data were obtained at each point during the calibration:

Engine gas producer speed
Engine output shaft speed
Engine output shaft torque
Engine torquemeter pressure
Gearbox pressure
Engine exhaust gas temperature
Fuel flow
Test cell ambient temperature
Test cell ambient pressure

The relationship between differential torque pressure (torquemeter pressure minus gearbox pressure) and engine torque determined from this calibration was used to determine engine torque during the evaluation. The relationship is presented in figure C-2.

Engine Vibration Measurement

4. Accelerometers were installed on the engine at the locations used for mounting vibration transducers for routine engine vibration tests, using standard transducer mounting adapters, as shown in figure C-3. These locations are as follows:

Forward vertical acceleration at front lifting eye
Fore/aft acceleration at diffuser flange
Aft vertical acceleration at oil scavenge line

These accelerometers, with their associated signal conditioning equipment, had an effective bandwidth of 4 to 400 Hz and a sensitivity of 0.1 volts per g. Data was sampled at 2,000 samples per second and recorded on magnetic tape.

Engine Inlet Pressure and Temperature Measurement

5. A standard UH-1H engine bellmouth was modified by installing 48 total pressure ports and six thermocouples as shown in figure C-4. An electronic pressure scanner system sequentially measured the differential pressure between each of the total pressure ports and a static pressure port located on the inside of the transmission housing at fuselage station 141, buttline 14, and waterline 72. The differential pressures were sampled at 31 samples per second and recorded on magnetic tape.

6. An error analysis and a post-project calibration of the thermocouple system yield the measurement uncertainties presented in table C-1. The relative error represents repeatability or stability of each probe over the period of the project and is applicable to both record-to-record comparisons and probe-to-probe comparisons. The absolute error represents the uncertainty relative to outside air temperature.

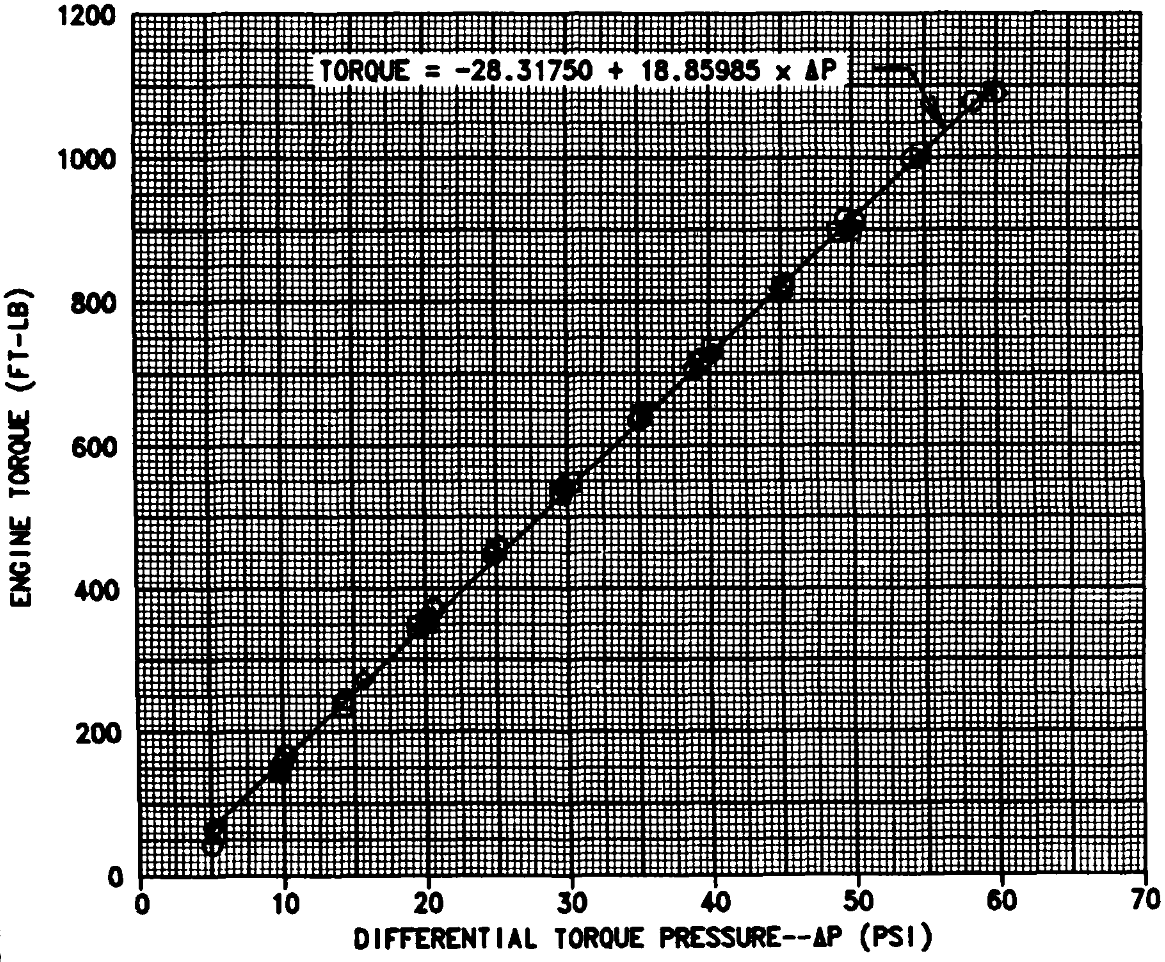
FIGURE C-2

ENGINE TORQUEMETER CALIBRATION

T53-L-13B S/N LE16820B

SYMBOL	OUTPUT SHAFT SPEED (RPM)	DATA SOURCE
⊙	6600	ENGINE TORQUEMETER CALIBRATION
⊡	6400	FROM TEST CONDUCTED AT CORPUS
◇	6000	CHRISTI ARMY DEPOT 13 JAN 87.

NOTE: DIFFERENTIAL PRESSURE, ΔP = TORQUEMETER PRESSURE MINUS GEARBOX PRESSURE.



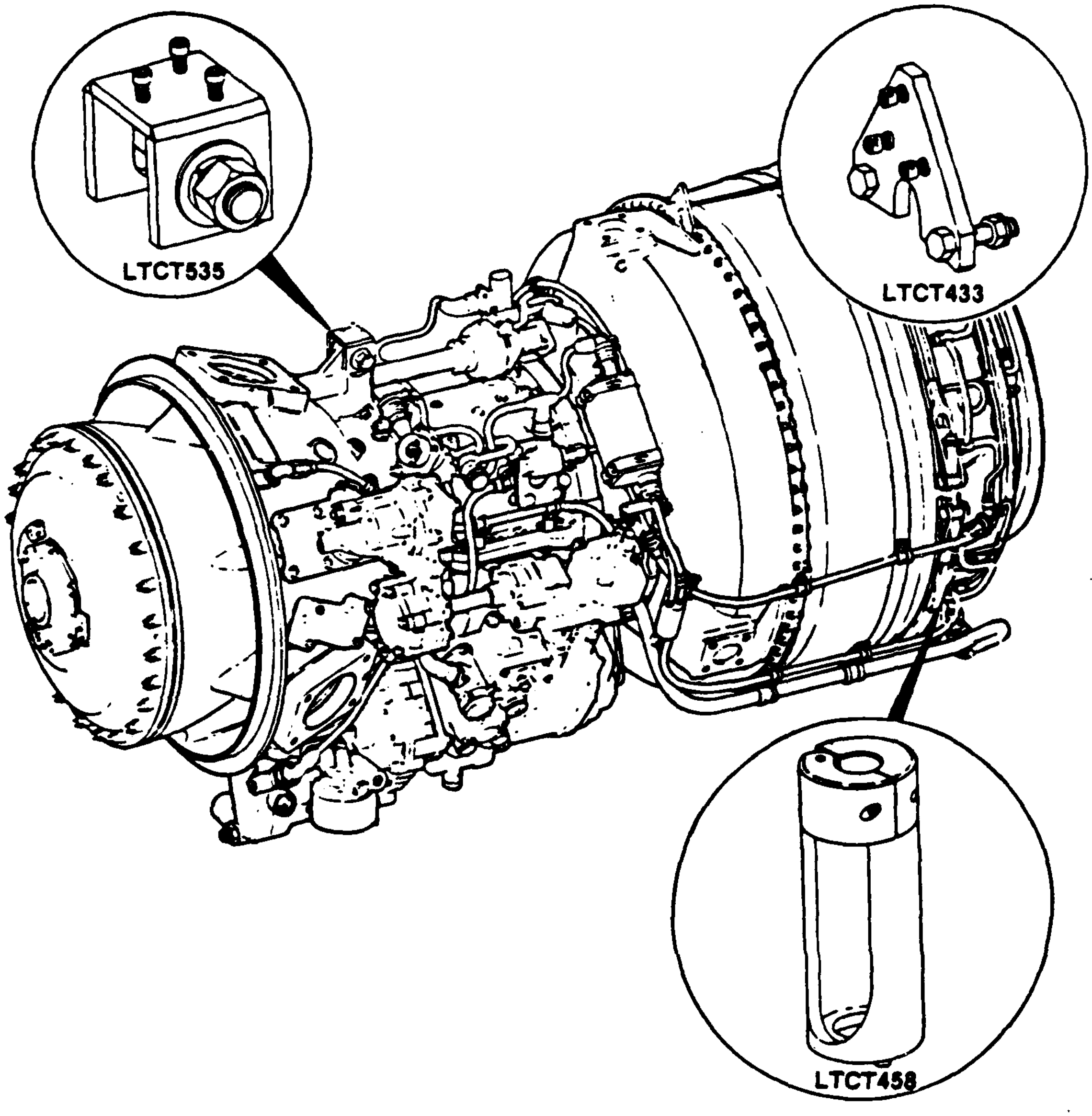


Figure C-3. Engine Accelerometer Locations

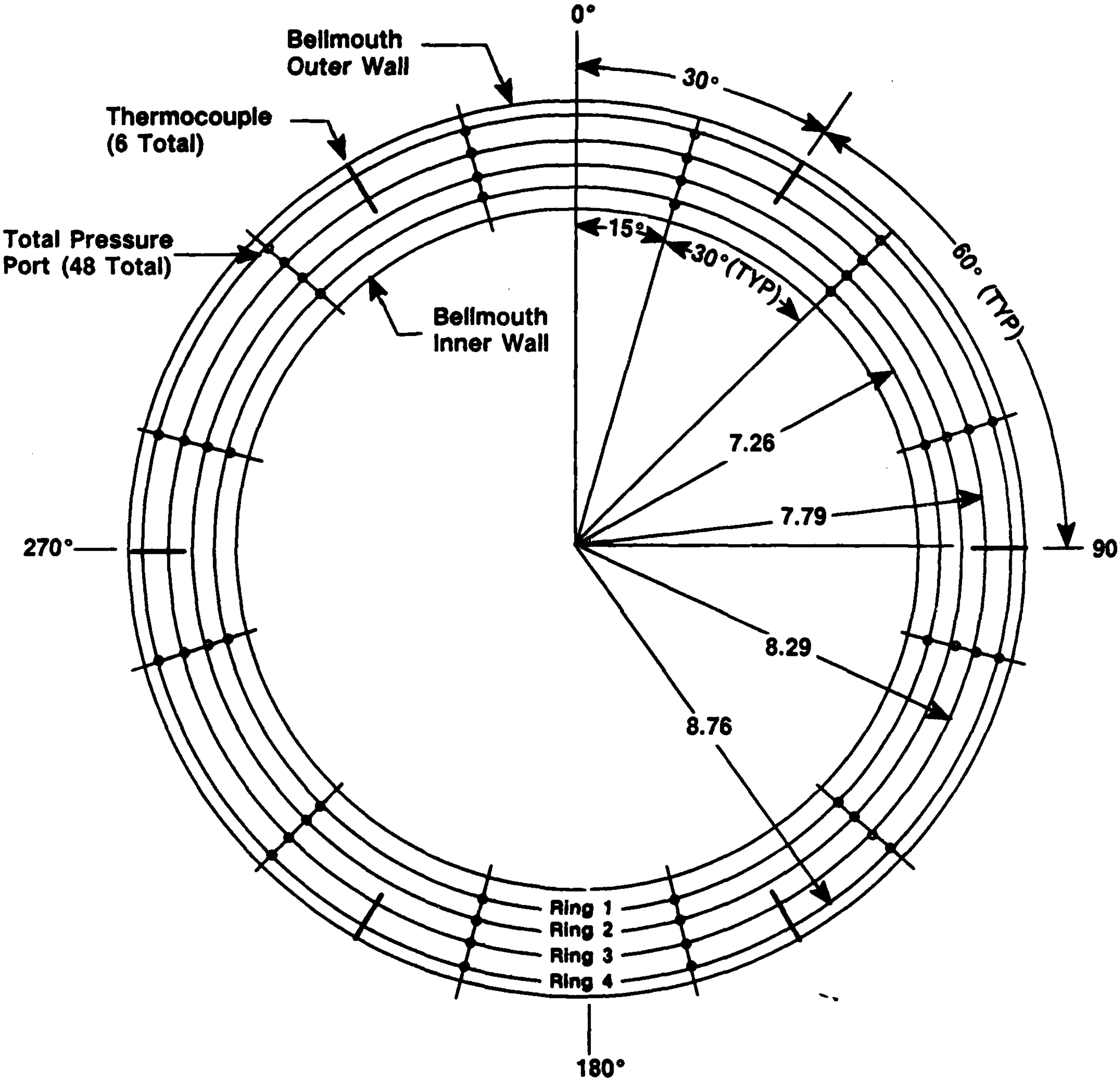


Figure C-4. Installation of Pressure Ports and Thermocouples in UH-1H Engine Inlet Bellmouth (view Looking Forward from Engine)

Table C-1. Thermocouple Error

Circumferential Location (Deg)	Relative Error Band (deg C)	Absolute Error Band (deg C)
30	-0.0/+0.1	-1.1/+1.2
90	-0.0/+0.1	-1.1/+1.2
150	-3.6/+0.0	-4.7/+1.1
210	-1.6/+0.0	-2.7/+1.1
270	-0.3/+0.0	-1.4/+1.1
330	0.0/0.0	-1.1/+1.1

SPECIAL EQUIPMENT

Weather Station

7. A portable weather station consisting of an anemometer, sensitive thermometer, and barometer was used to record wind speed and direction and ambient temperature and pressure for hover tests and low-speed flight tests. The anemometer was mounted on a tower whose height could be adjusted between 10 to 50 feet above ground level.

Load Cell

8. A calibrated load cell and sensitive accelerometers were incorporated with the aircraft cargo hook to measure cable tension and longitudinal and lateral cable angles during the tethered hover tests.

Ground Pace Vehicle

9. A calibrated "fifth wheel" ground speed indicating system was attached to a ground pace vehicle to provide a ground speed reference during the low-speed tests.

APPENDIX D. TEST TECHNIQUES AND DATA ANALYSIS METHODS

AIRCRAFT WEIGHT AND BALANCE

1. Before the start of the evaluation, the aircraft was weighed with all instrumentation installed except the pressure scanners, their interface box, and the pneumatic lines connecting the scanners to the inlet rake, with all fuel drained and full oil. The initial weight of the aircraft was 5744 pounds, with longitudinal center of gravity (cg) at fuselage station (FS) 145.7.

2. A manometer-type external sight gauge was previously calibrated and was used to determine fuel volume. Fuel specific gravity was measured with a hydrometer. The fuel loading for each test flight was determined both before engine start and after engine shutdown. Fuel used in flight was recorded manually from a test fuel-used system and compared with the preflight and postflight sight gauge readings. Fuel cg versus fuel volume contained in the fuel cell (209.0-gallon capacity) was previously determined. This calibration was used to calculate aircraft cg for each test point. Aircraft gross weight and cg were also controlled by installing ballast in the aircraft.

AIRCRAFT PERFORMANCE

General

3. Helicopter performance was generalized through the use of nondimensional coefficients as follows:

a. Coefficient of power (C_P):

$$C_P = SHP \frac{(550)}{\rho A (\Omega R)^3} \tag{1}$$

b. Coefficient of Thrust (C_T):

$$C_T = \frac{GW + Cable\ \ Tension}{\rho A (\Omega R)^2} \tag{2}$$

c. Advance Ratio (μ):

$$\mu = \frac{V_T\ (1.68781)}{\Omega R} \tag{3}$$

d. Advancing Blade Tip Mach Number (M_{tip}):

$$M_{tip} = \frac{V_T(1.68781) + (\Omega R)}{a} \tag{4}$$

e. Referred Rotor Speed = $N_R/\sqrt{\theta}$

Where:

SHP = Engine output shaft horsepower (shp)

ϱ = Ambient air density (lb-sec²/ft⁴)
A = Main rotor disc area (ft²) = 1809.56
Ω = Main rotor angular velocity (radians/sec)
R = Main rotor radius (ft) = 24.000
GW = Gross weight (lb)

V_T = True Airspeed (kt) = $\dfrac{V_E}{1.68781\sqrt{\varrho/\varrho_o}}$

1.68781 = Conversion factor (ft/sec-kt)

ϱ_o = 0.0023769 (lb-sec²/ft⁴)

V_E = Equivalent airspeed (ft/sec) =

$$\left\{7(70.7262)\frac{P_a}{\varrho_o}\left[\left(\frac{Q_c}{P_a}+1\right)^{2/7}-1\right]\right\}^{1/2}$$

70.7262 = Conversion factor (lb/ft²-in.-Hg)

Q_c = Dynamic pressure (in.-Hg)

P_a = Ambient air pressure (in.-Hg)

a = Speed of sound (ft/sec) = $1116.45\sqrt{\theta}$

$\theta = (T_a + 273.15)/288.15$

T_a = Ambient air temperature (deg C)

N_R = Main rotor speed (rpm)

4. The engine output shaft torque was determined from the engine manufacturer's torque system. The relationship of measured torque pressure to engine output shaft torque was determined from the engine test cell calibration presented in figure C-2, appendix C as follows:

$$Q = -28.31750 + 18.85985\ x\ \Delta P$$

Where:

Q = Engine output shaft torque (ft-lb)

ΔP = Torquemeter pressure minus gearbox pressure (lb/ft²)

5. Engine output shaft power was determined by the following equation:

$$SHP = (2\pi)N_P\ \frac{Q}{33,000} = \frac{N_P(Q)}{5252.113}$$

Where:

N_P = Engine output shaft rotational speed (rpm)
33,000 = Conversion factor (ft-lb/min-SHP)

Hover Performance

6. Hover performance was obtained by the tethered hover technique. All tests were conducted in winds less than three knots.

7. Tethered hover consists of tethering the aircraft to the ground by a cable in series with a load cell incorporated with the cargo hook. The cable length was adjusted to give a skid height of 60 feet, measured at the rear of the left skid. The calculated actual gross weight of the aircraft plus the cable tension measured by the load cell equals the equivalent gross weight for calculating C_T. Atmospheric pressure and temperature and wind speed and direction were measured by a ground weather station described in appendix C.

8. All hovering data were reduced to nondimensional parameters C_P and C_T as shown in equations 1 and 2 above. A least-squares regression of the form $C_P = A_0 + A_1 \; C_T^{\;1.5}$ was performed.

Level Flight Performance

9. Each level flight performance test point was flown in ball-centered flight at a predetermined C_T and referred rotor speed $(N_R/\sqrt{\theta})$. To maintain a constant ratio of gross weight to pressure ratio (W/δ), altitude was increased as fuel was consumed. To maintain a constant referred rotor speed, actual rotor speed was varied as ambient temperature varied.

10. Test-day level flight data was corrected to average test-day conditions as follows:

$$V_{T_s} = V_{T_t}\left(\frac{N_{R_s}}{N_{R_t}}\right)$$

$$SHP_s = SHP_t\left(\frac{\varrho_s}{\varrho_t}\right)\left(\frac{N_{R_s}}{N_{R_t}}\right)^3$$

$$M_{tip_s} = \frac{V_{T_s}(1.68781) + \Omega_s R}{a_s}$$

Where:

Subscript s = Average test day
Subscript t = Test day

11. Specific range was derived from level flight power required and fuel flow. Referred shaft power and referred fuel flow were calculated as follows:

$$\text{Referred Shaft Power} = \frac{SHP_t}{(\delta)(\theta)^{0.587}}$$

$$\text{Referred Fuel Flow} = \frac{W_{f_t}}{(\delta)(\theta)^{0.712}}$$

Where:

$\delta = P_a/29.92125$

W_f = Fuel flow rate (lb/hr)

A curve fit was applied to this referred data and used to correct test day fuel flow to average test day fuel flow as follows:

$$W_{f_s} = W_{f_t} + \Delta W_f$$

Where:

ΔW_f = Change in fuel flow between SHP_t and SHP_s

Specific Range was calculated as follows:

$$SR = \frac{V_{T_s}}{W_{f_s}}$$

Where:

SR = Specific range (nautical air miles/lb fuel)

Test data corrected to average test day conditions is presented in figures E-4 through E-6 and E-9 through E-11.

12. Level flight data was analyzed by use of a simulated three-dimensional plot (C_T and μ versus C_P) for each configuration. The reduction of these plots to a family of curves of C_T versus C_P for constant values of μ allows determination of power required as a function of airspeed for any value of C_T.

INLET PRESSURE DISTORTION

13. Engine inlet pressures were measured and recorded as described in appendix C. Total pressure at each port was calculated as follows:

$$P = \Delta P + P_{static}$$

Where:

P = Total pressure
ΔP = Differential pressure (measured at each port)
P_{static} = Pressure at transmission housing static pressure port

Circumferential and radial total pressure distributions were determined as described in reference 9, appendix A. Circumferential total pressure distribution is determined for each ring separately, without regard for the pressure distribution of the other rings. The average total pressure for each ring is calculated as follows:

$$PAV = \frac{P15 + P45 + . . . + P345}{12}$$

Where:

PAV = Average total pressure for ring
P15 = Total pressure at port at 15-degree position of ring
P45 = Total pressure at port at 45-degree position of ring
•
•
•

P345 = Total pressure at port at 345-degree position of ring

Radial pressure distribution is ring-to-ring variation. The face average total pressure is calculated as follows:

$$PFAV = \frac{(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4}{4}$$

Where:

PFAV = Face average total pressure
$(PAV)_1$ = Average total pressure for ring 1
•
•
•

$(PAV)_4$ = Average total pressure for ring 4

REFERRED ENGINE PARAMETERS

14. Installation losses are presented as referred engine gas generator speed and referred fuel flow required to produce referred shaft power. These referred parameters are calculated as follows:

$$\text{Referred Gas Generator Speed} = \frac{N_G}{\sqrt{\theta}}$$

$$\text{Referred Fuel Flow} = \frac{W_f}{(\delta)(\theta^{0.712})}$$

$$\text{Referred Shaft Power} = \frac{SHP}{(\delta)(\theta^{0.587})}$$

Where:

N_G = Gas generator speed

PRESSURE RECOVERY RATIO

15. The pressure recovery ratio is the ratio of average total pressure at the engine inlet to free stream total pressure. Pressure recovery ratio was calculated as follows:

$$\text{Pressure recovery ratio} = \frac{PFAV}{P_a + Q_c}$$

HANDLING QUALITIES

General

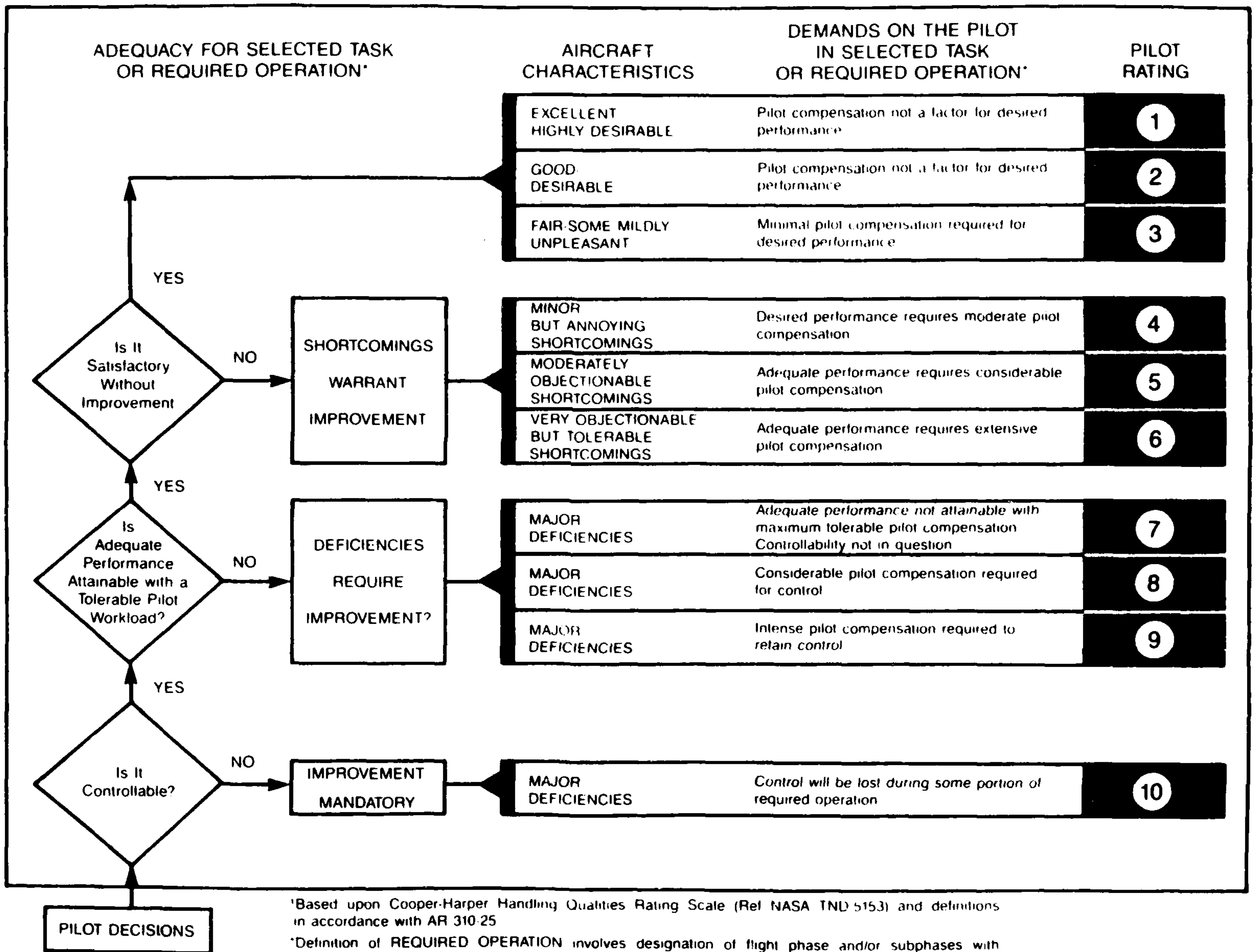
16. Handling qualities data were collected and evaluated using standard test methods as described in reference 7, appendix A.

Low-Speed Flight

17. Low-speed tests were performed by using a ground pace vehicle equipped with a calibrated "fifth wheel" ground speed indicating system as a speed reference. Wind velocity (speed and direction) were measured by a ground weather station and recorded at each test point. The aircraft was flown at relative wind azimuths of zero to 330 degrees in increments of 30 degrees measured from the nose of the aircraft. At each azimuth, the aircraft was flown at ground speeds of 5 knots through 30 knots in 5-knot increments, with the aircraft keeping formation with the ground pace vehicle. True airspeed is the algebraic sum of ground pace vehicle speed and the component of wind velocity in the direction of flight. All low airspeed tests were conducted in winds of less than 5 knots.

18. The Handling Qualities Rating Scale presented in figure D-1 was used to augment pilot comments relative to handing qualities and workload.

19. The Vibration Rating Scale presented in figure D-2 was used to augment pilot comments relative to vibration.



*Based upon Cooper-Harper Handling Qualities Rating Scale (Ref NASA TND 5153) and definitions in accordance with AR 310-25

*Definition of REQUIRED OPERATION involves designation of flight phase and/or subphases with accompanying conditions

Figure D-1. Handling Qualities Rating Scale

DEGREE OF VIBRATION	DESCRIPTION[1]	PILOT RATING
No vibration		0
Slight	Not apparent to experienced aircrew fully occupied by their tasks, but noticeable if their attention is directed to it or if not otherwise occupied.	1, 2, 3
Moderate	Experienced aircrew are aware of the vibration but it does not affect their work, at least over a short period.	4, 5, 6
Severe	Vibration is immediately apparent to experienced aircrew even when fully occupied. Performance of primary task is affected or tasks can only be done with difficulty.	7, 8, 9
Intolerable	Sole preoccupation of aircrew is to reduce vibration level.	10

[1]Based on the Subjective Vibration Assessment Scale developed by the Aeroplane and Armament Experimental Establishment, Boscombe Down, England.

Figure D-2. Vibration Rating Scale

DEFINITIONS

20. A deficiency is defined as a defect or malfunction discovered during the life cycle of an item of equipment that constitutes a safety hazard to personnel; will result in serious damage to the equipment if operation is continued; or indicates improper design or other cause of failure of an item or part, which seriously impairs the equipment's operational capability.

21. A shortcoming is defined as an imperfection or malfunction occurring during the life cycle of equipment which must be reported and which should be corrected to increase efficiency and to render the equipment completely serviceable. It will not cause an immediate breakdown, jeopardize safe operation, or materially reduce the usability of the material or end product.

APPENDIX E. TEST DATA

INDEX

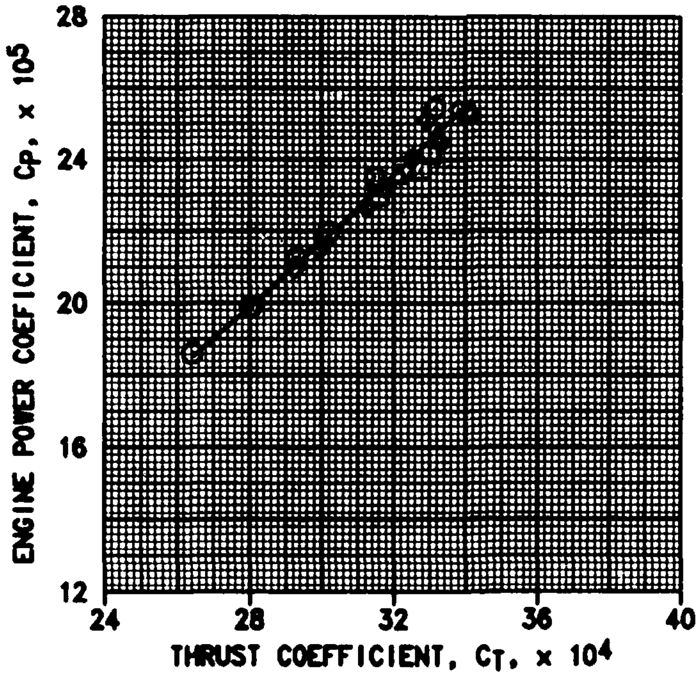
FIGURE E-1

NONDIMENSIONAL HOVER PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
SKID HEIGHT = 60 FT

SYM	AVG DENSITY ALTITUDE (FT)	AVG REFERRED ROTOR SPEED (RPM)	AVG OAT (DEG C)	FILTER
⊙	1030	331.4	2.5	STD
⊡	1140	300.0	3.0	STD
◇	1040	330.3	1.5	IEAFS
△	980	301.7	1.0	IEAFS

NOTES:
1. SKID HEIGHT MEASURED FROM BOTTOM OF AFT END OF LEFT SKID.
2. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF MAIN ROTOR HUB = 13 FEET.
3. TESTS CONDUCTED WITH AIRCRAFT TETHERED TO GROUND.
4. WINDS LESS THAN THREE KNOTS.



$C_P = A_0 + A_1 C_T^{1.5}$

$A_0 = 3.337032 \times 10^{-5}$

$A_1 = 1.117454$

FIGURE E-2

NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
STANDARD FILTER INSTALLED

NOTES:
1. BALL-CENTERED TRIM CONDITION
2. AVERAGE LONGITUDINAL CG AT FS 137.8
3. AVERAGE LATERAL CG AT BL 0.1 LEFT
4. AVERAGE REFERRED ROTOR SPEED = 312.7 RPM
5. POINTS DERIVED FROM FIGURES E-4 THROUGH E-6
6. DASHED LINE INDICATES EXTRAPOLATED DATA

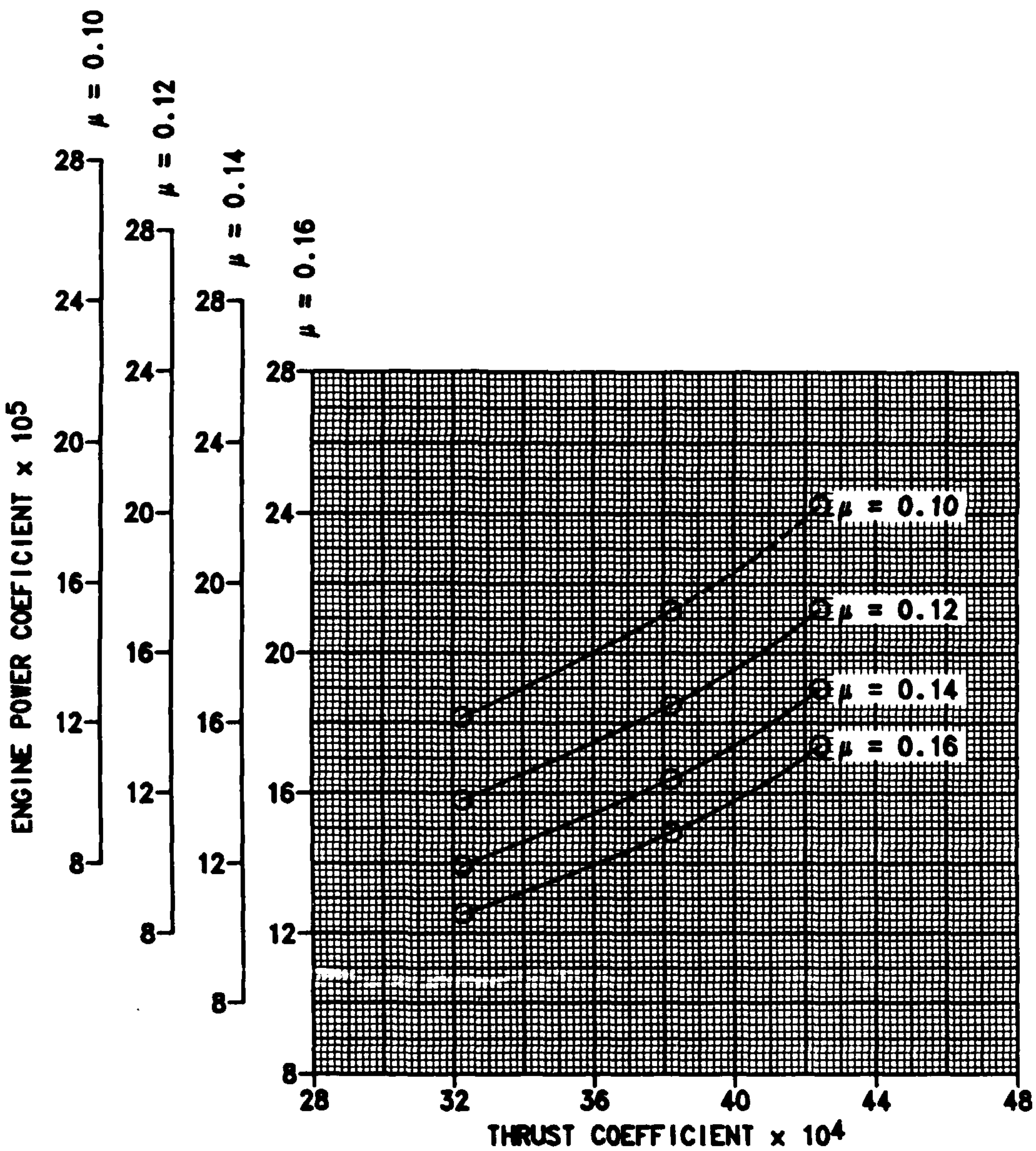


FIGURE E-3

NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
STANDARD FILTER INSTALLED

NOTES:
1. BALL-CENTERED TRIM CONDITION
2. AVERAGE LONGITUDINAL CG AT FS 137.8
3. AVERAGE LATERAL CG AT BL 0.1 LEFT
4. AVERAGE REFERRED ROTOR SPEED = 312.7 RPM
5. POINTS DERIVED FROM FIGURES E-4 THROUGH E-6
6. DASHED LINE INDICATES EXTRAPOLATED DATA

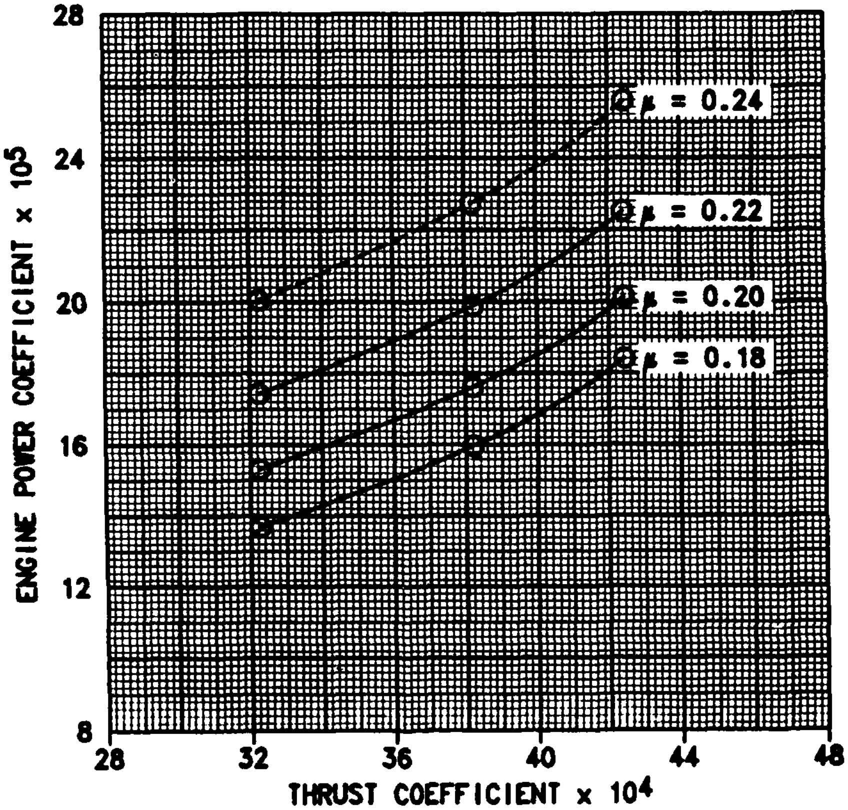


FIGURE E-4

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG C_T $\times 10^4$
7160	138.4	0.1 LT	5450	9.5	312.7	32.26

NOTE: BALL-CENTERED TRIM CONDITION

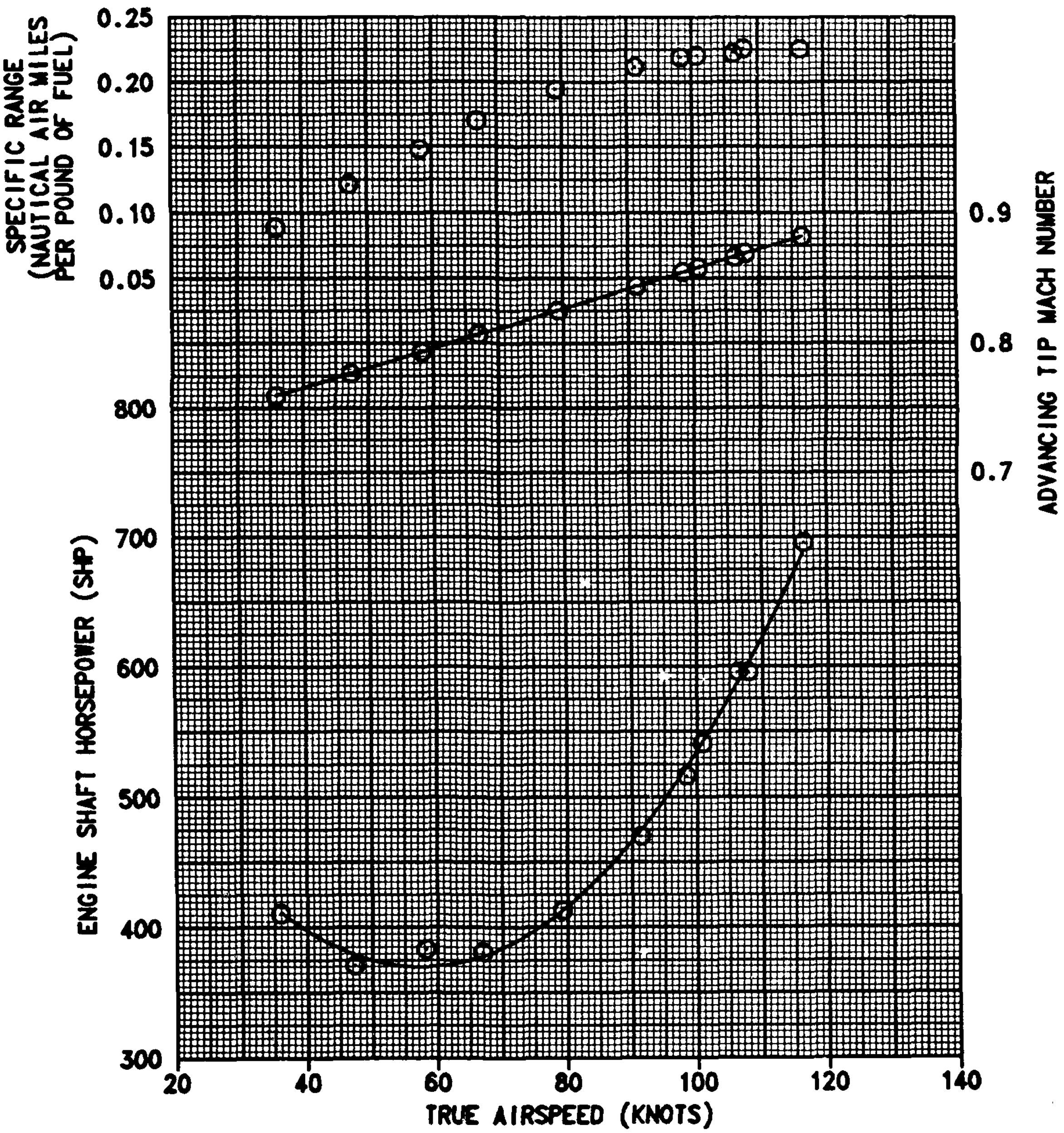


FIGURE E-5

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG $C_T \times 10^4$
8490	136.9	0.1 LT	5200	7.0	313.0	38.21

NOTE: BALL-CENTERED TRIM CONDITION

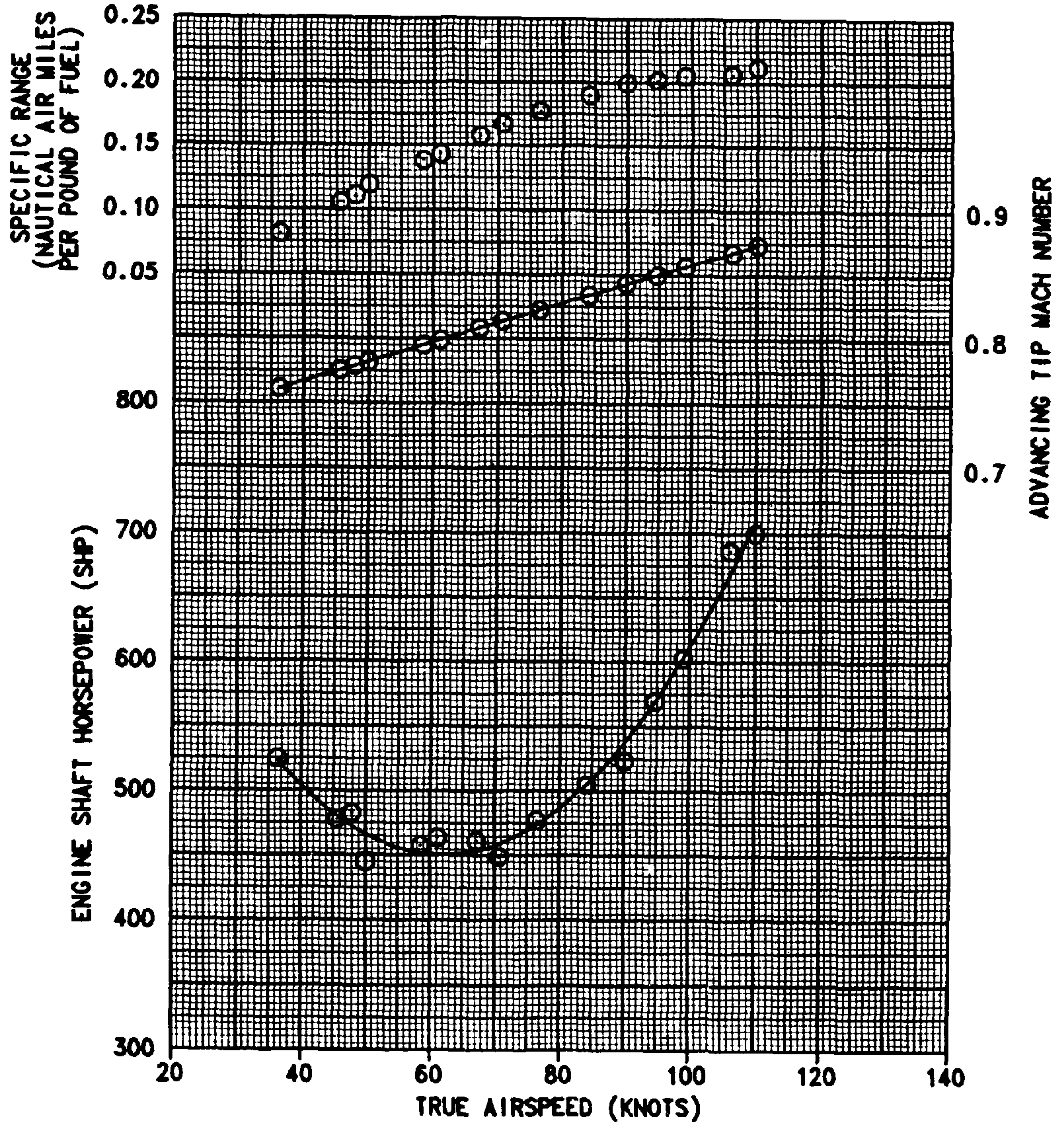


FIGURE E-6

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG C_T $\times 10^4$
9190	138.2	0.1 LT	5820	6.5	312.5	42.43

NOTE: BALL-CENTERED TRIM CONDITION

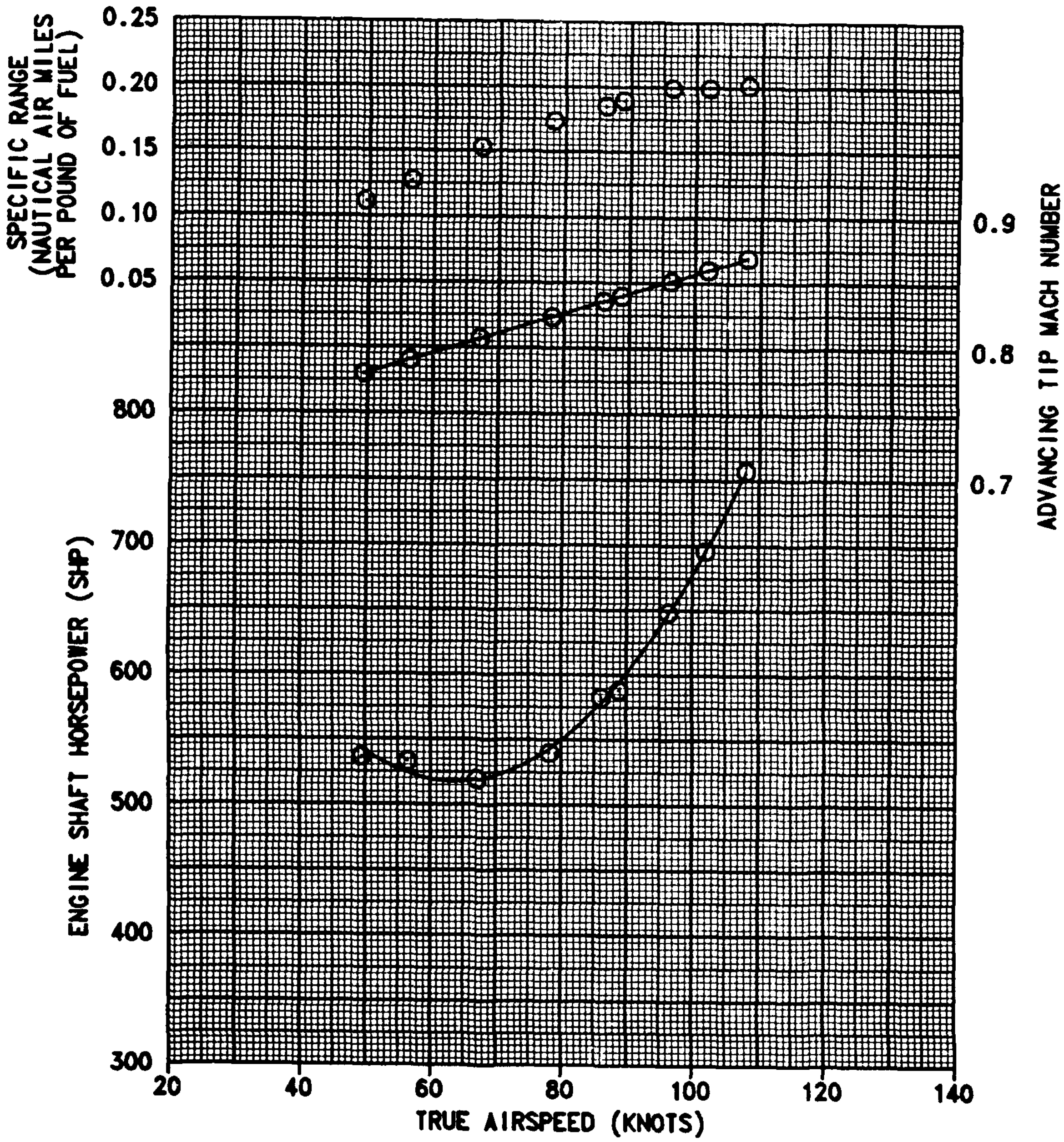


FIGURE E-7

NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

NOTES:
1. BALL-CENTERED TRIM CONDITION
2. AVERAGE LONGITUDINAL CG AT FS 137.1
3. AVERAGE LATERAL CG AT BL 0.0
4. AVERAGE REFERRED ROTOR SPEED = 313.3 RPM
5. POINTS DERIVED FROM FIGURES E-9 THROUGH E-11

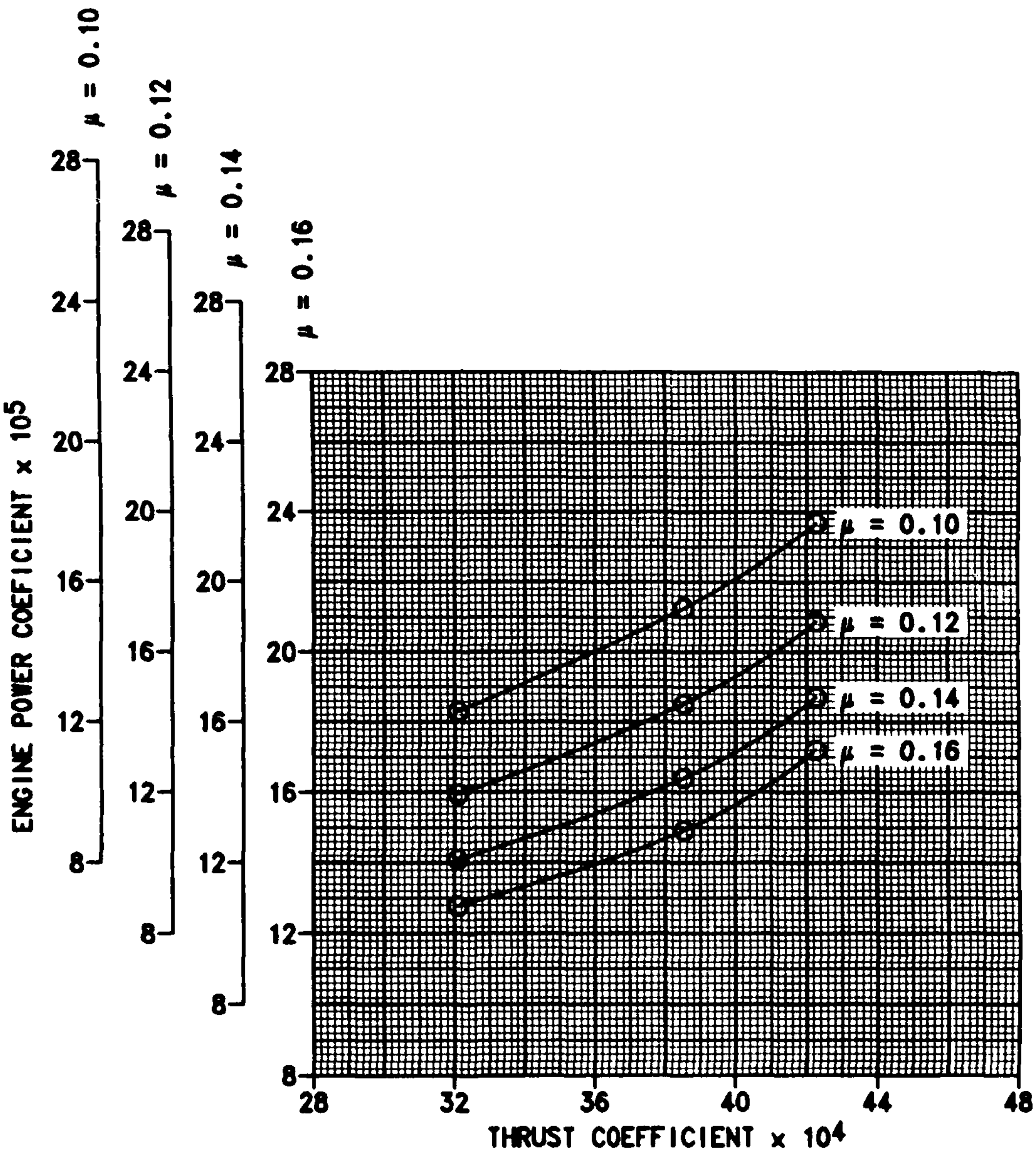


FIGURE E-8

NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

NOTES:
1. BALL-CENTERED TRIM CONDITION
2. AVERAGE LONGITUDINAL CG AT FS 137.1
3. AVERAGE LATERAL CG AT BL 0.0
4. AVERAGE REFERRED ROTOR SPEED = 313.3 RPM
5. POINTS DERIVED FROM FIGURES E-9 THROUGH E-11

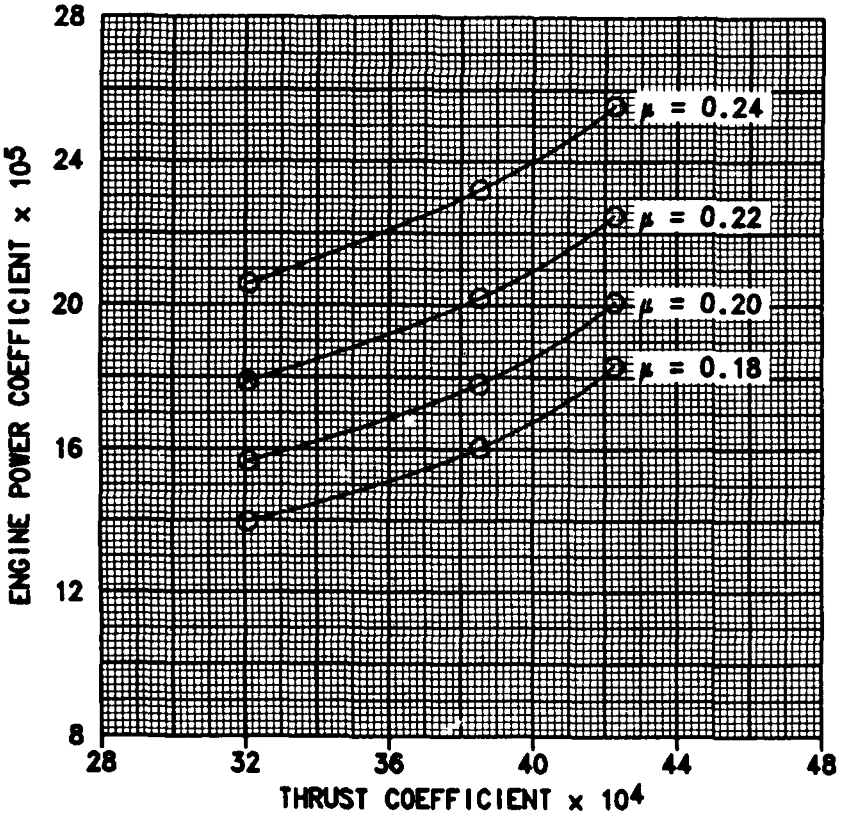


FIGURE E-9

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG $C_T \times 10^4$
7320	137.6	0.0	5180	13.5	313.6	32.09

NOTE: BALL-CENTERED TRIM CONDITION

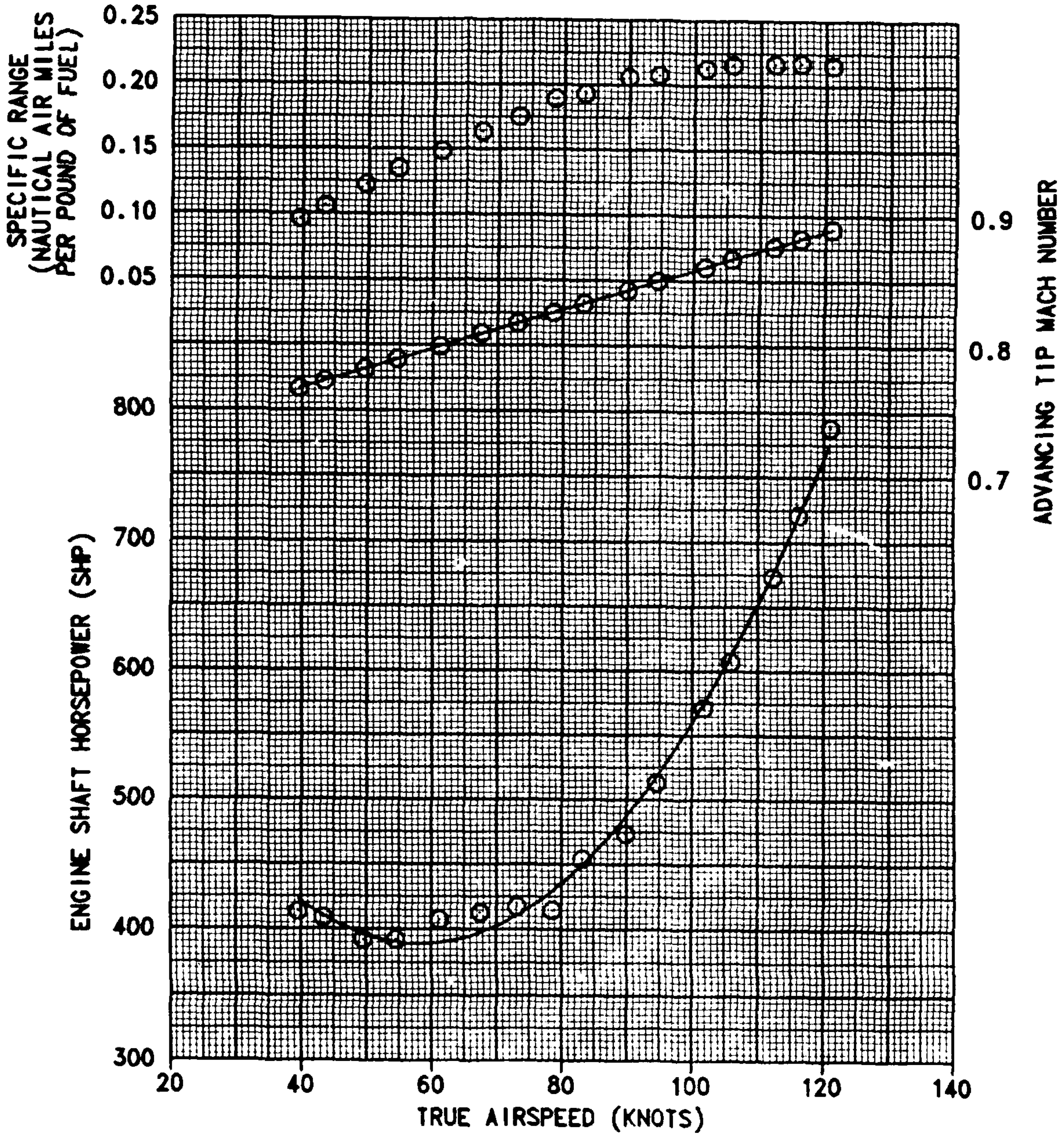


FIGURE E-10

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG C_T $\times 10^4$
8400	136.3	0.0	6030	11.0	312.7	38.53

NOTE: BALL-CENTERED TRIM CONDITION

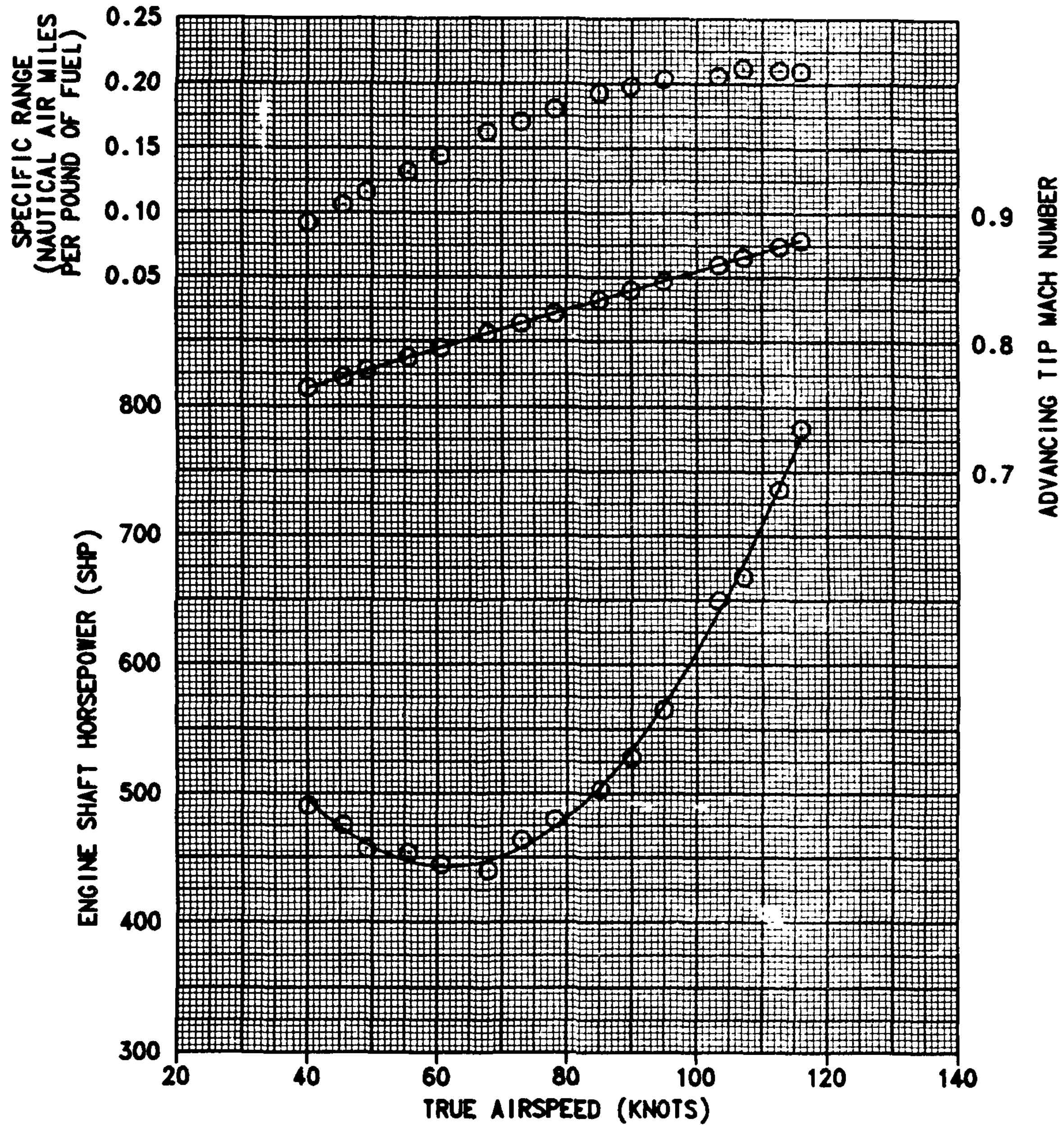


FIGURE E-11

LEVEL FLIGHT PERFORMANCE

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG $C_T \times 10^4$
9080	137.5	0.0	6510	9.0	313.6	42.26

NOTE: BALL-CENTERED TRIM CONDITION

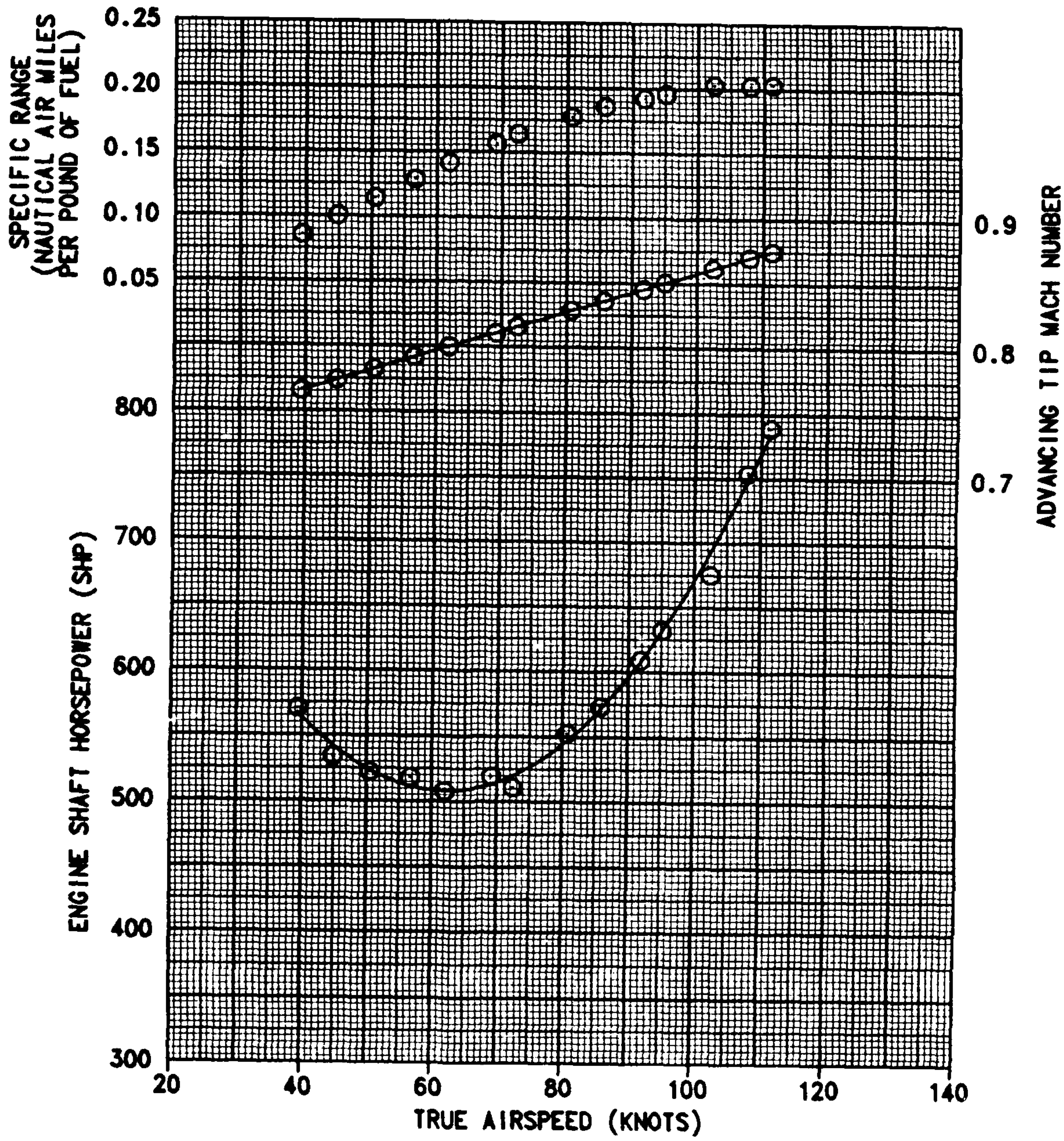


FIGURE E-12

ENGINE VIBRATIONS
HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG SKID HEIGHT (FT)
8680	137.0	0.0	3320	20.0	321	970	25

NOTES: 1. FREE HOVER

2. WINDS LESS THAN THREE KNOTS

3. VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

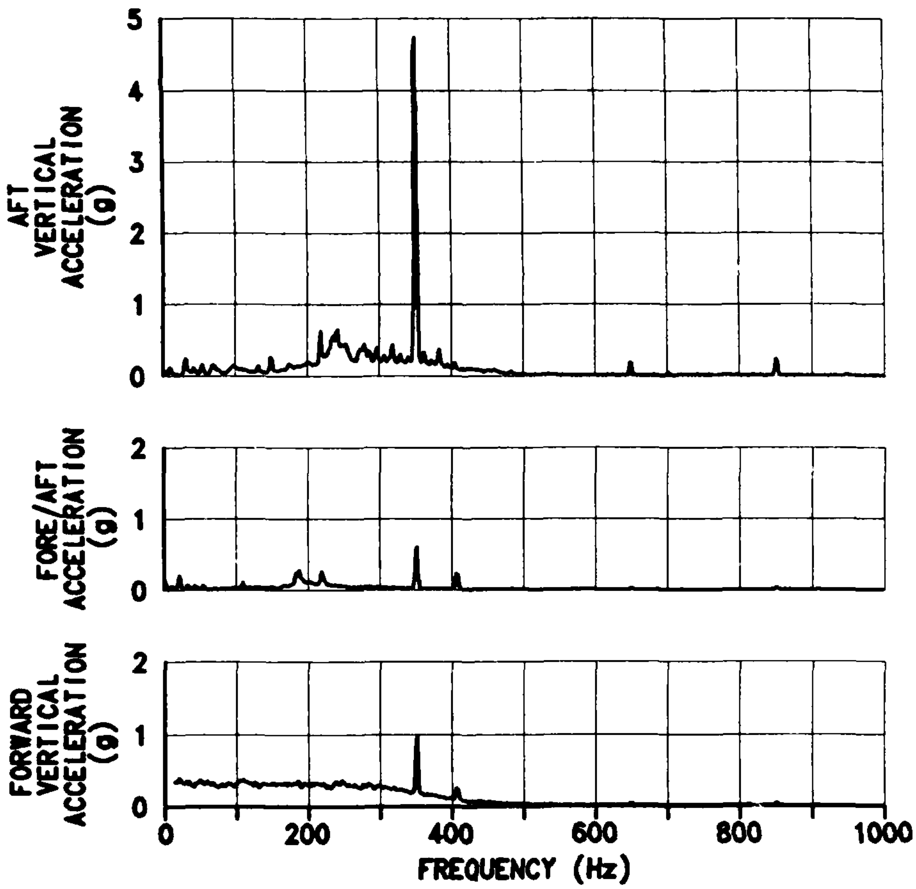


FIGURE E-13

ENGINE VIBRATIONS
HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG SKID HEIGHT (FT)
8710	137.0	0.0	2150	10.0	320	941	25

NOTES:
1. FREE HOVER
2. WINDS LESS THAN THREE KNOTS
3. VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

   FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

   FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

   AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

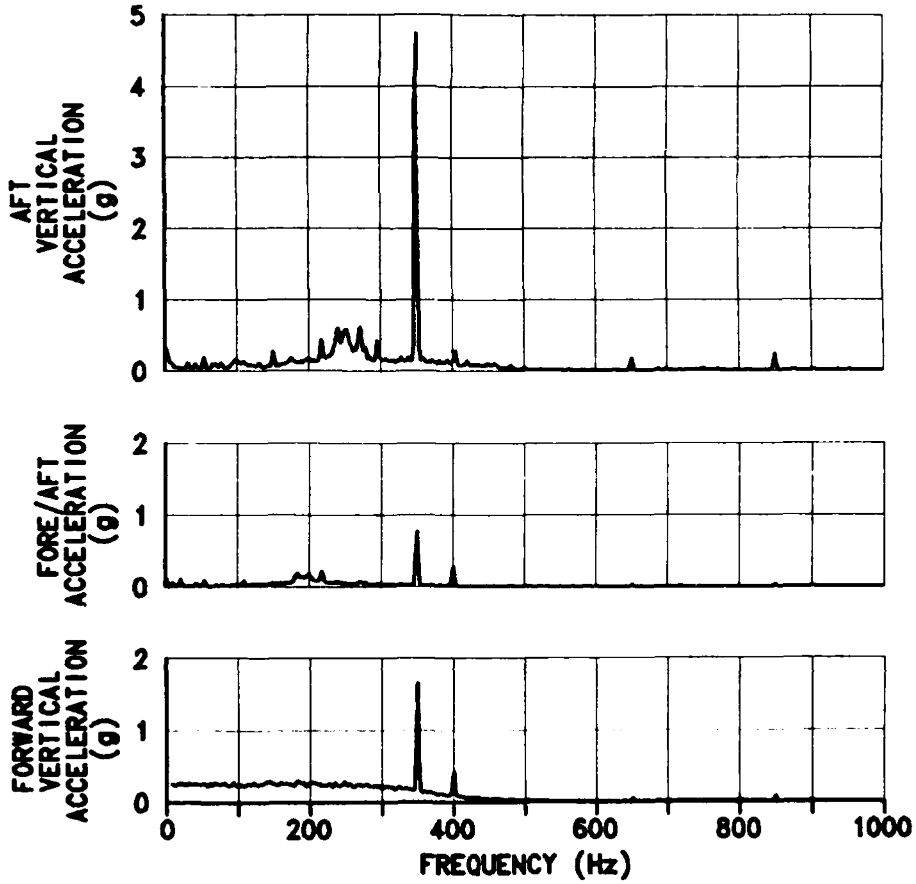


FIGURE E-14

ENGINE VIBRATIONS
LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9250	139.2	0.0	5800	7.5	309	549	71	3.5 UP	1.2 RT

NOTE: VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

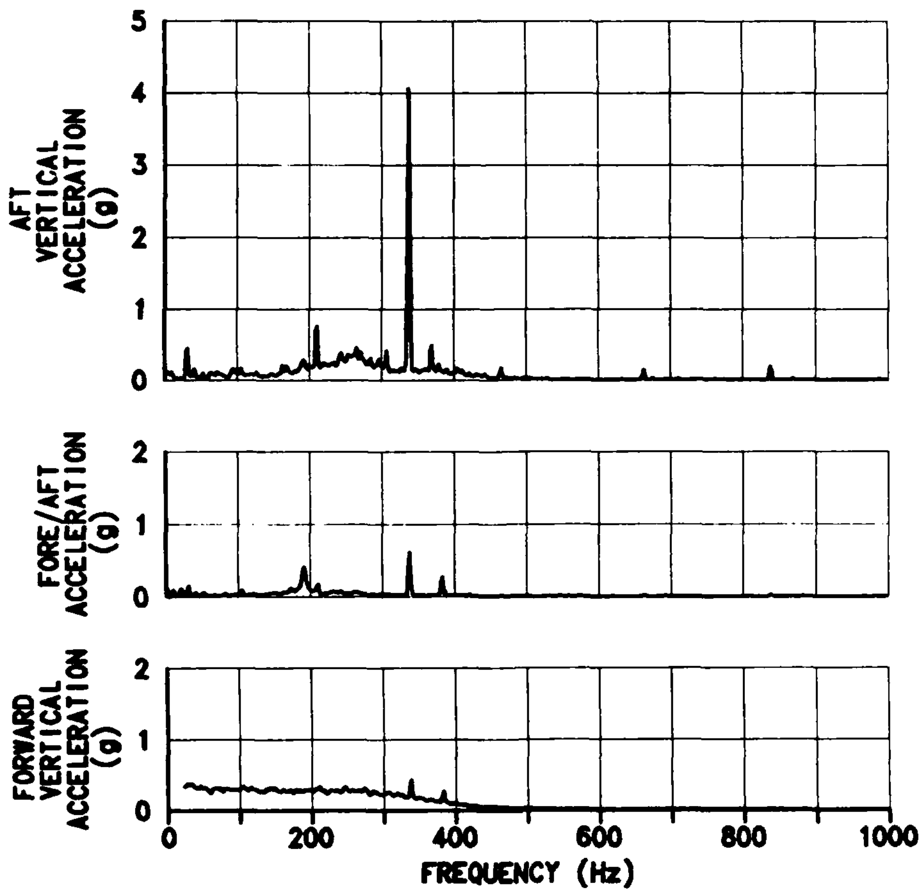


FIGURE E-15

ENGINE VIBRATIONS

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9190	138.2	0.0	6410	11.0	311	555	72	3.2 UP	0.5 LT

NOTE: VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

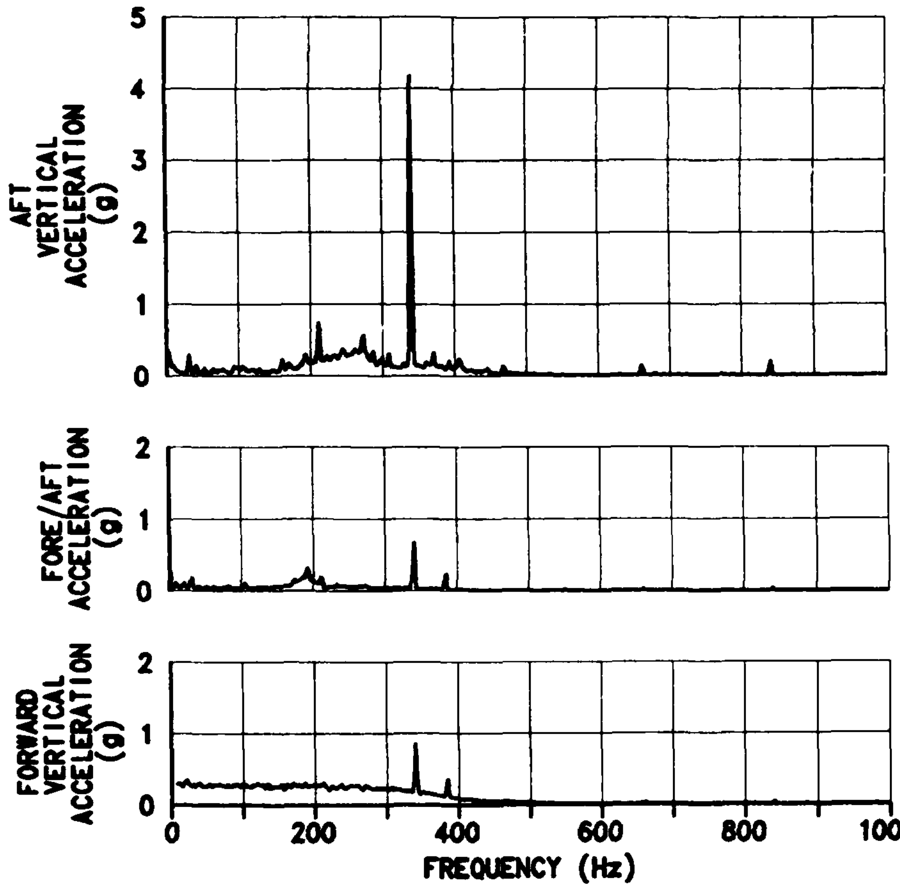


FIGURE E-16

ENGINE VIBRATIONS
CLIMBING BALL-CENTERED FLIGHT
JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9090	138.7	0.0	6620	6.0	324	977	91	1.2 DN	0.3 RT

NOTE: VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

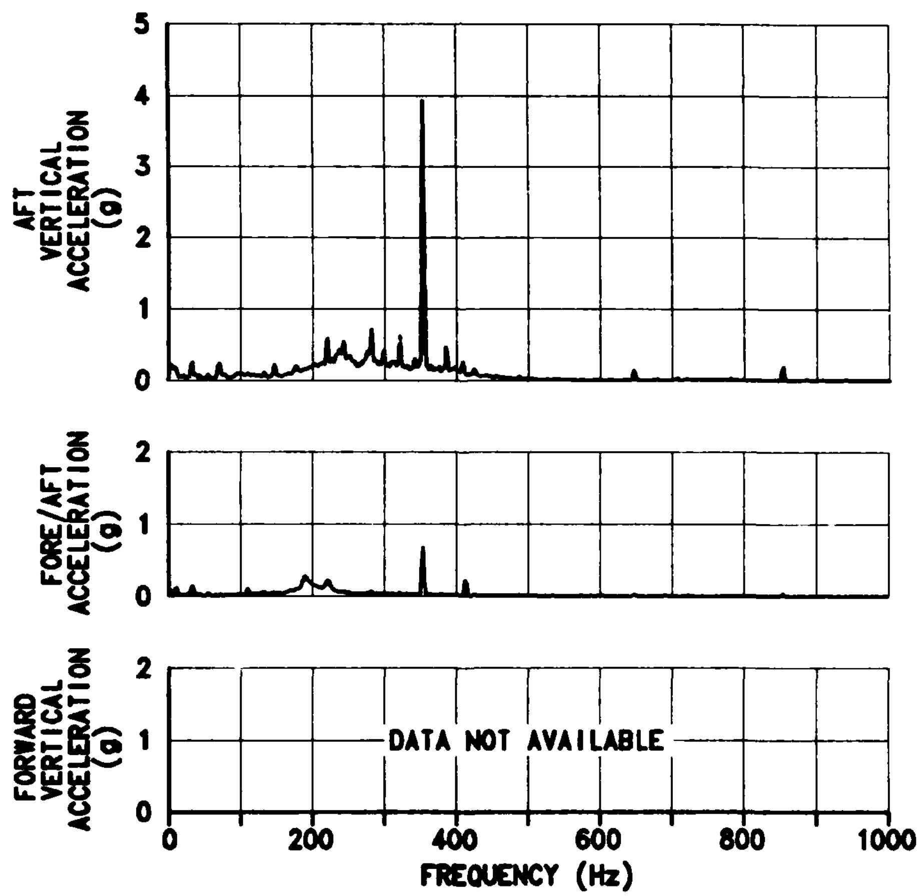


FIGURE E-17

ENGINE VIBRATIONS
CLIMBING BALL-CENTERED FLIGHT
JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SHAFT POWER (SHP)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9000	137.6	0.0	6660	10.5	322	986	92	2.1 DN	1.1 LT

NOTE: VIBRATION MEASURED AT LOCATIONS USED FOR MOUNTING VIBRATION TRANSDUCERS FOR ROUTINE ENGINE VIBRATION TESTS:

FORWARD VERTICAL VIBRATION MEASURED AT FRONT LIFTING EYE

FORE/AFT VIBRATION MEASURED AT DIFFUSER FLANGE

AFT VERTICAL VIBRATION MEASURED AT OIL SCAVENGE LINE

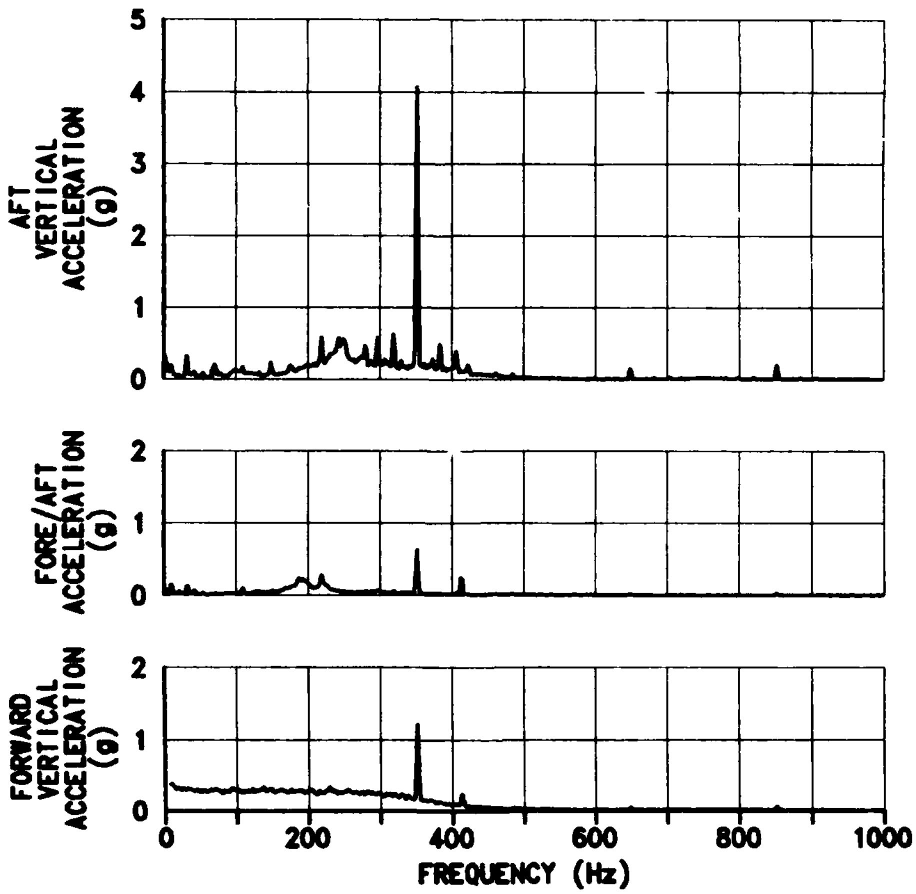


FIGURE E-18

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8770	137.2	0.0	2220	21.0	322	3

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

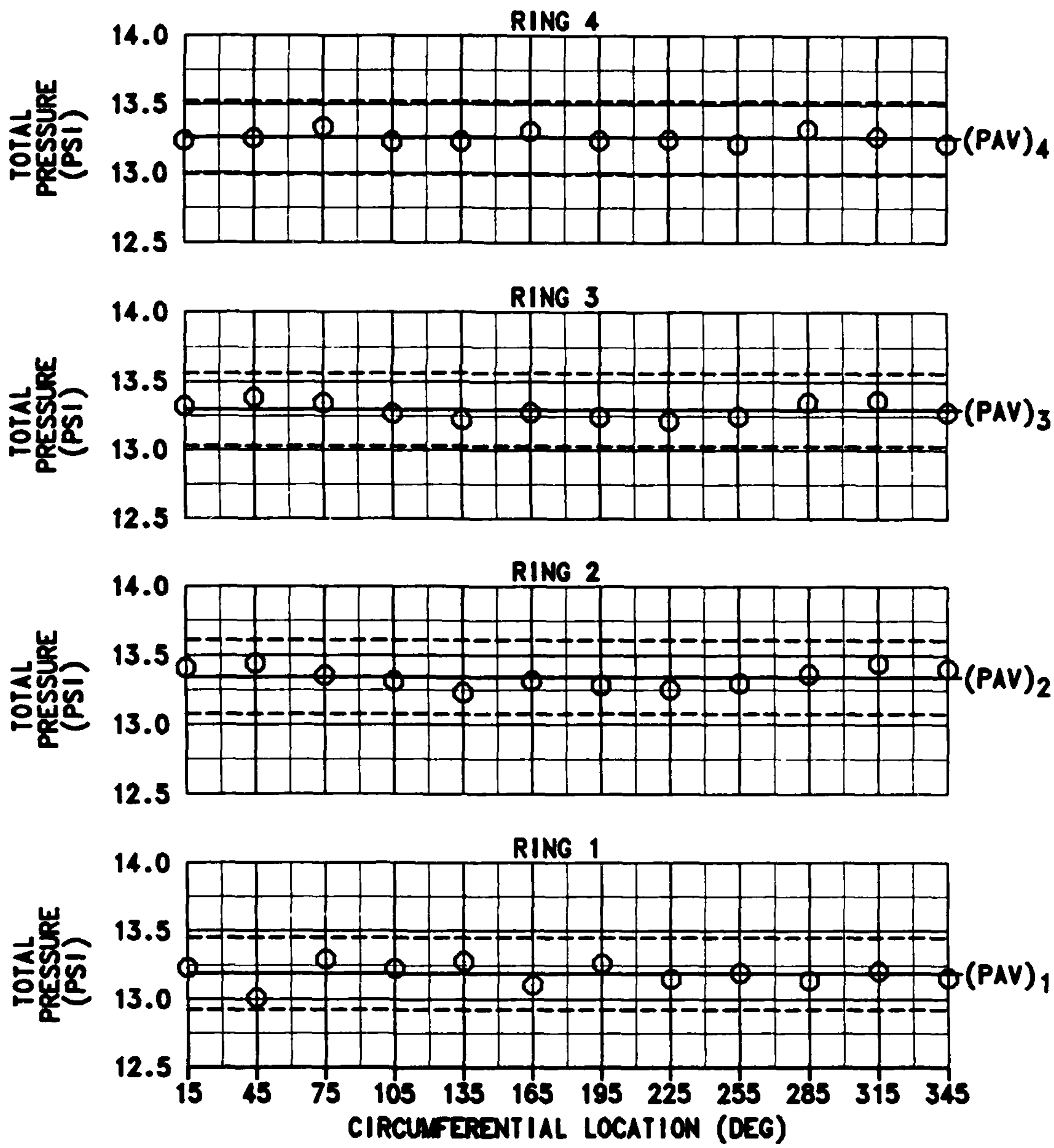


FIGURE E-19

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8770	137.2	0.0	2220	21.0	322	3

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = [(PAV)$_1$ + (PAV)$_2$ + (PAV)$_3$ + (PAV)$_4$]/4.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

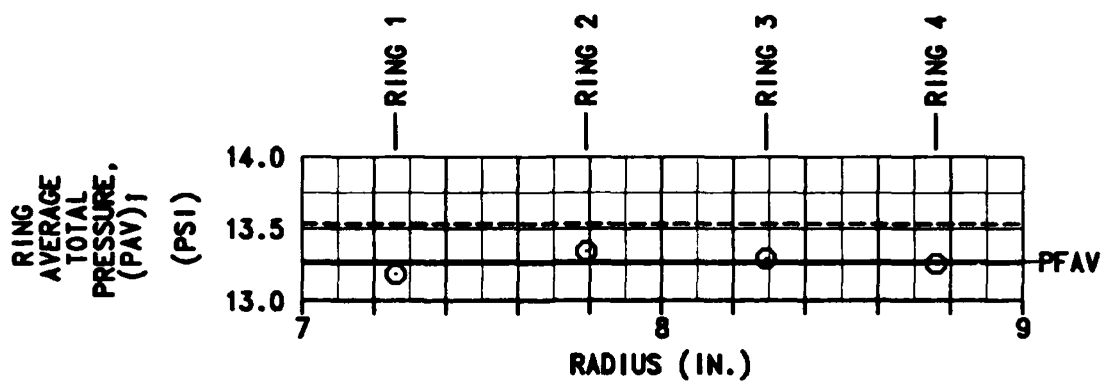


FIGURE E-20

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8780	137.3	0.0	2220	9.0	321	2

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

3. WINDS LESS THAN THREE KNOTS.

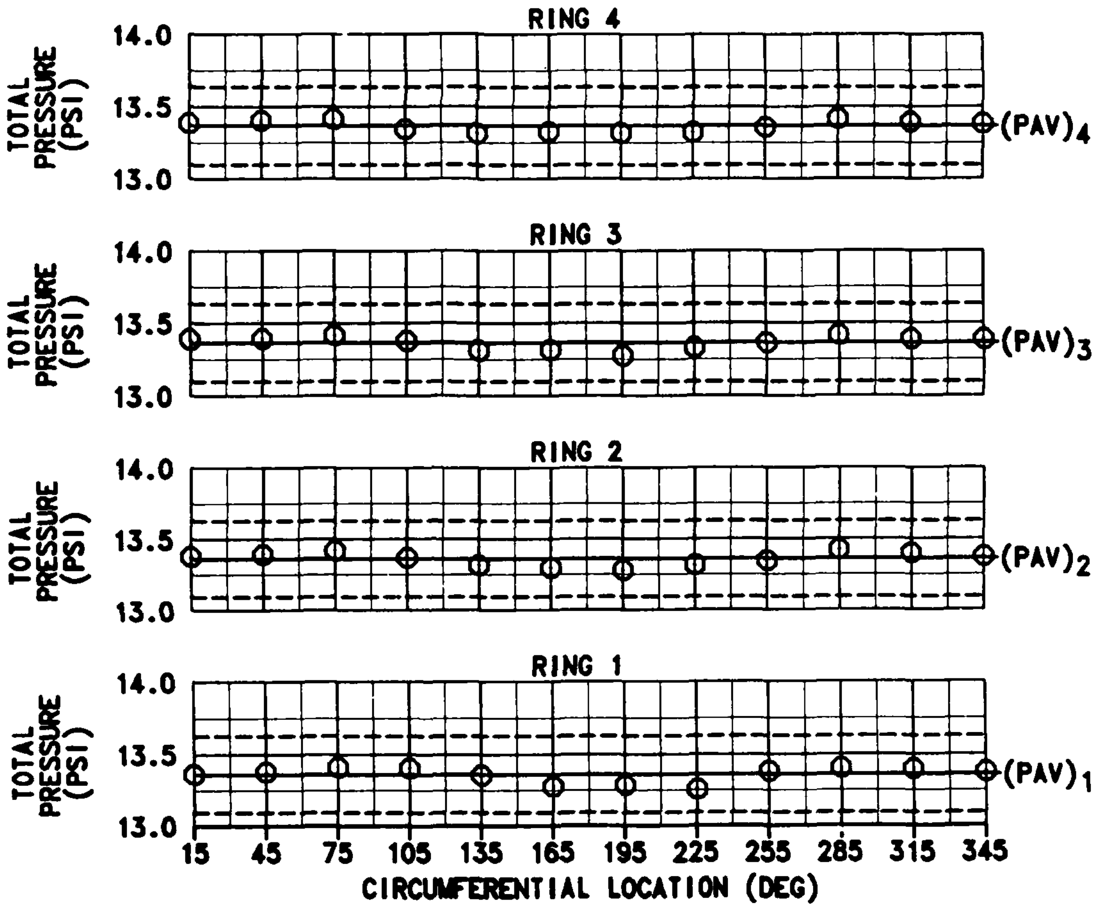


FIGURE E-21

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8780	137.3	0.0	2220	9.0	321	2

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

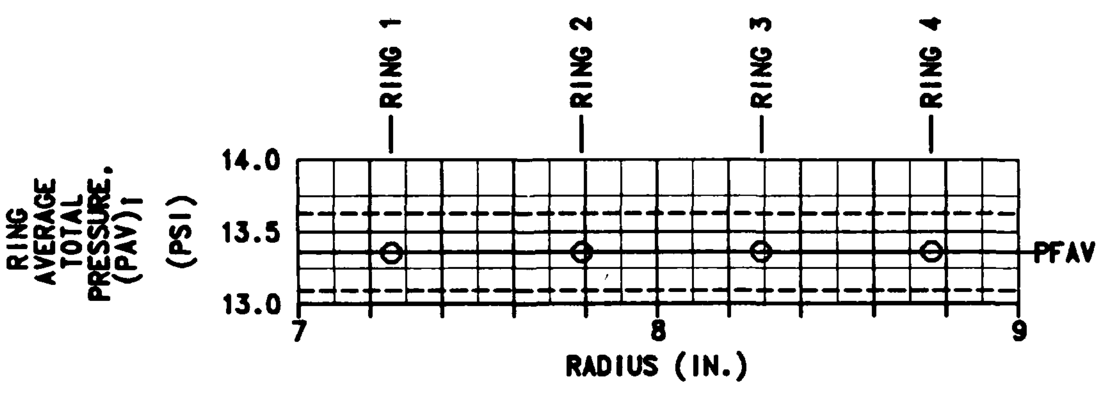


FIGURE E-22

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8640	136.8	0.0	2230	20.0	321	51

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

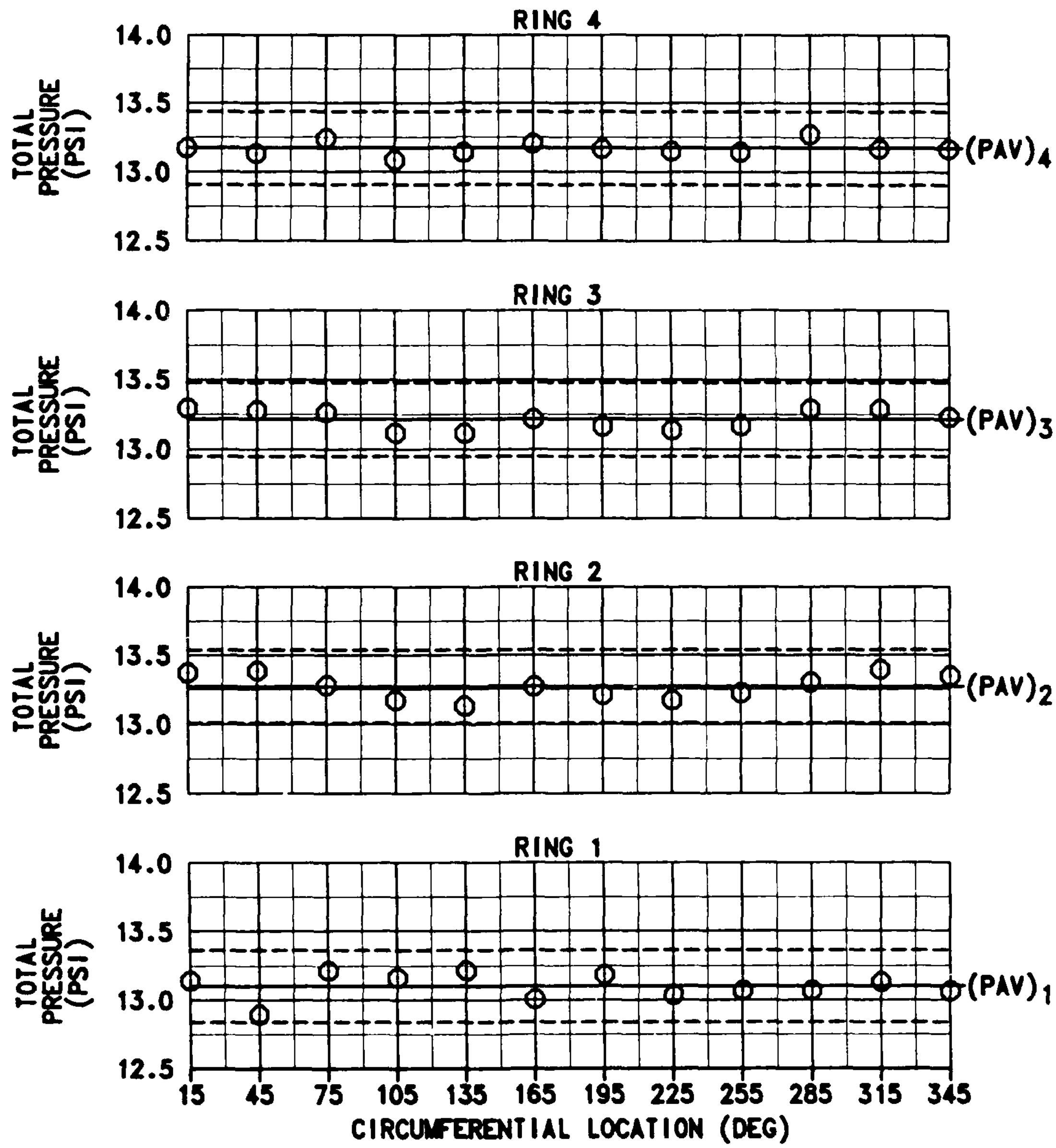


FIGURE E-23

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8640	136.8	0.0	2230	20.0	321	51

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

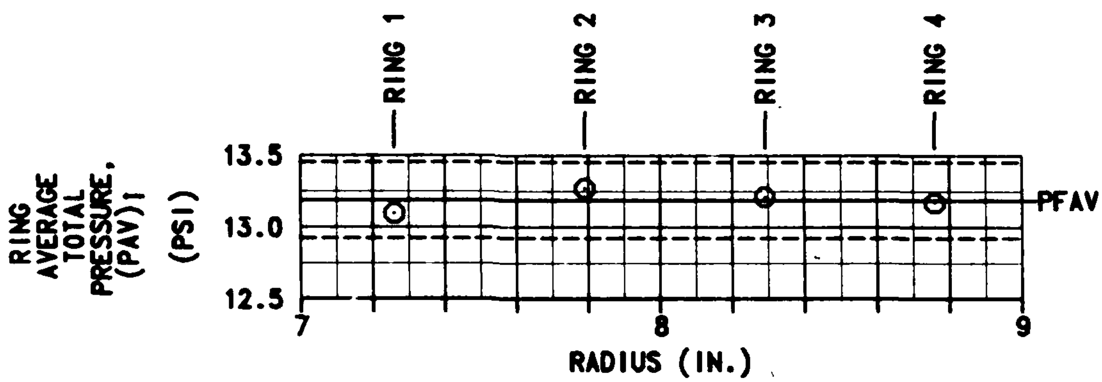


FIGURE E-24

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8680	137.0	0.0	2220	10.0	320	51

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

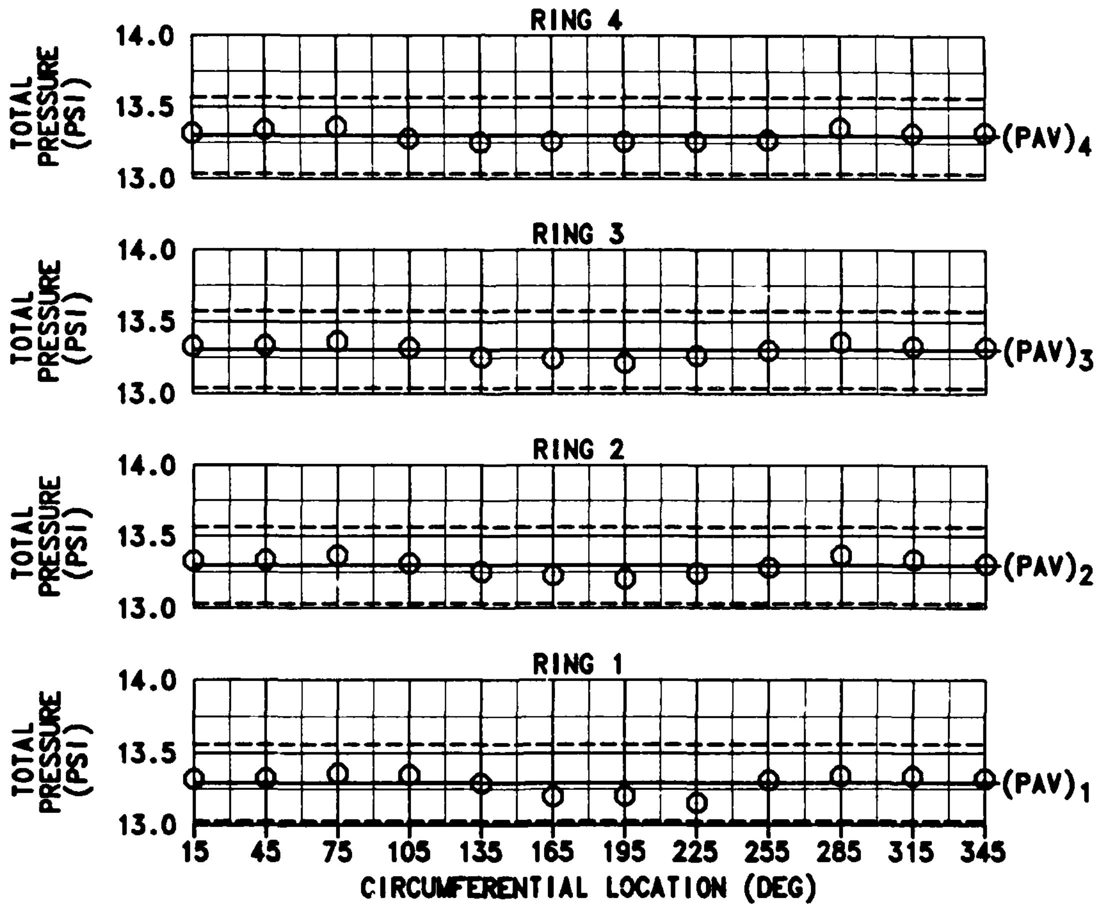


FIGURE E-25

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
HOVERING FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8680	137.0	0.0	2220	10.0	320	51

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE:
   PFAV = [(PAV)$_1$ + (PAV)$_2$ + (PAV)$_3$ + (PAV)$_4$]/4.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

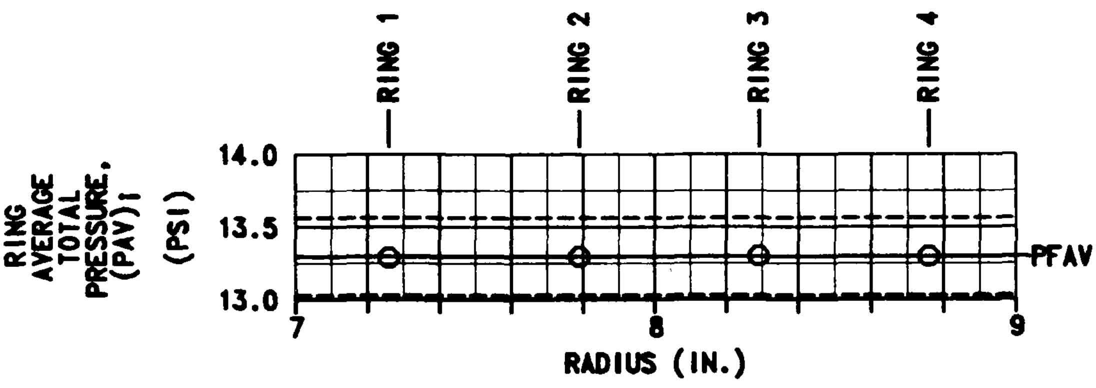


FIGURE E-26

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9210	139.1	0.0	5500	7.5	308	93	1.9 UP	0.2 RT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

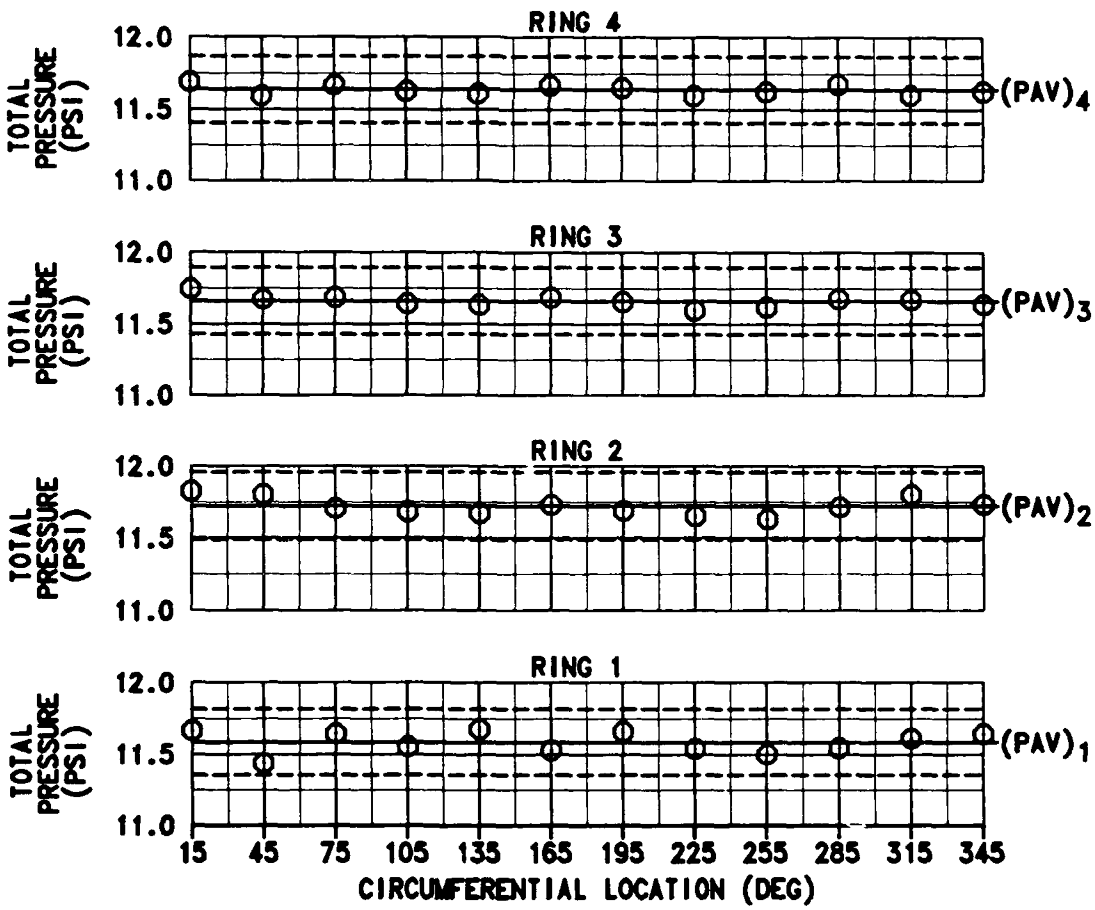


FIGURE E-27

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9210	139.1	0.0	5500	7.5	308	93	1.9 UP	0.2 RT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

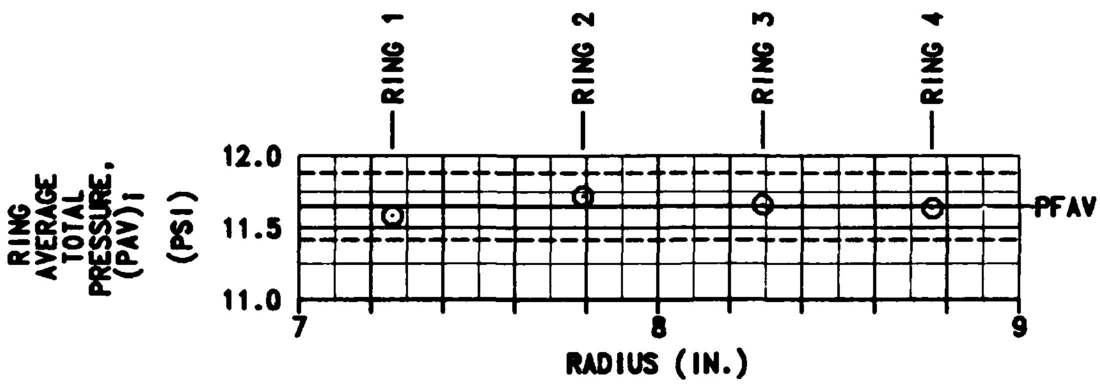


FIGURE E-28

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9210	139.1	0.0	5500	7.5	308	93	1.9 UP	0.2 RT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

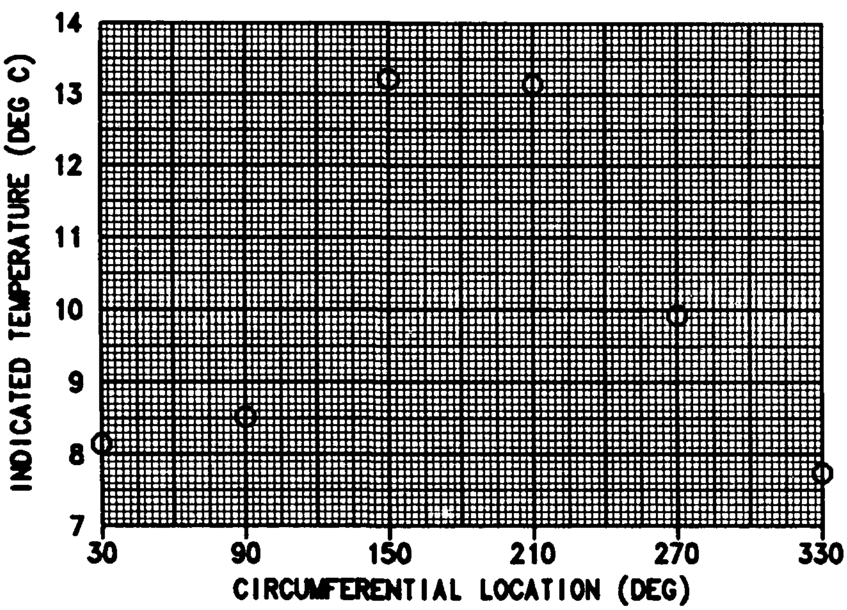


FIGURE E-29

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9120	138.0	0.0	5810	10.5	310	93	1.6 UP	0.5 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

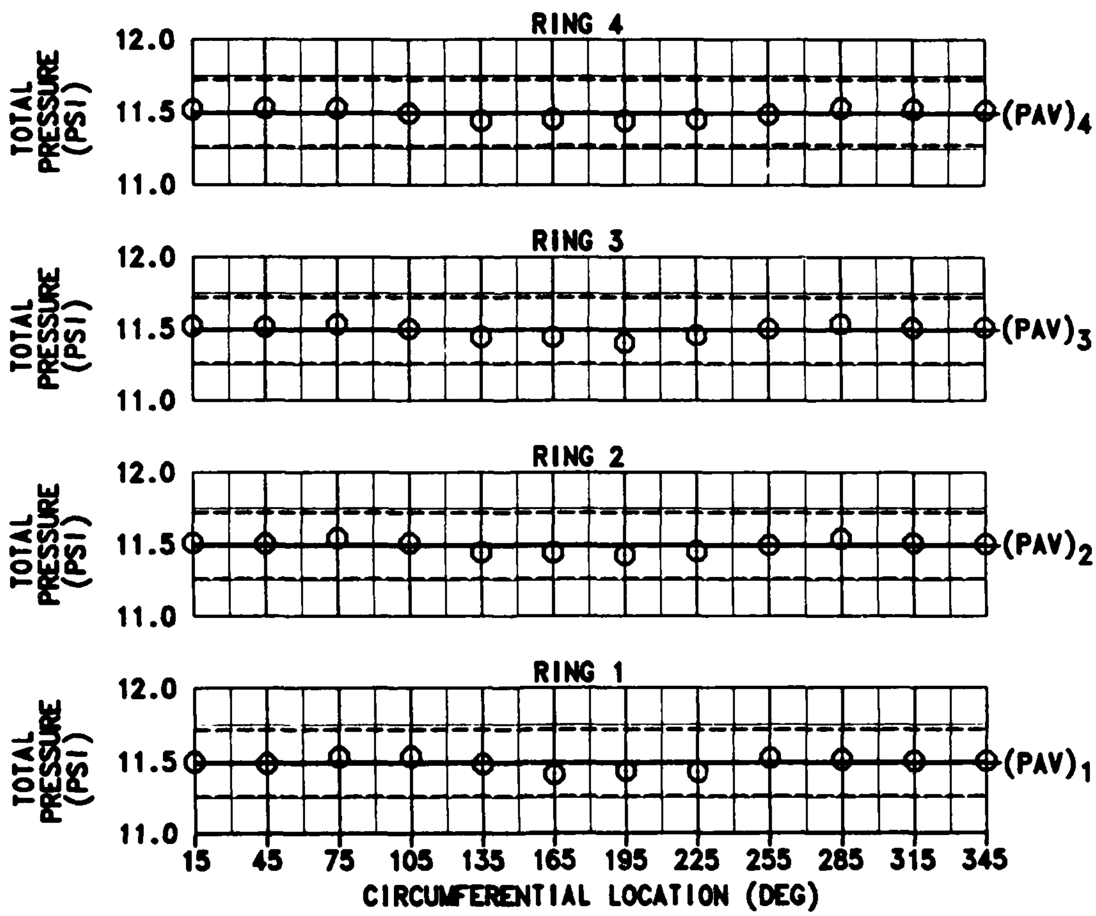


FIGURE E-30

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9120	138.0	0.0	5810	10.5	310	93	1.6 UP	0.5 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE:
$PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4.$

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

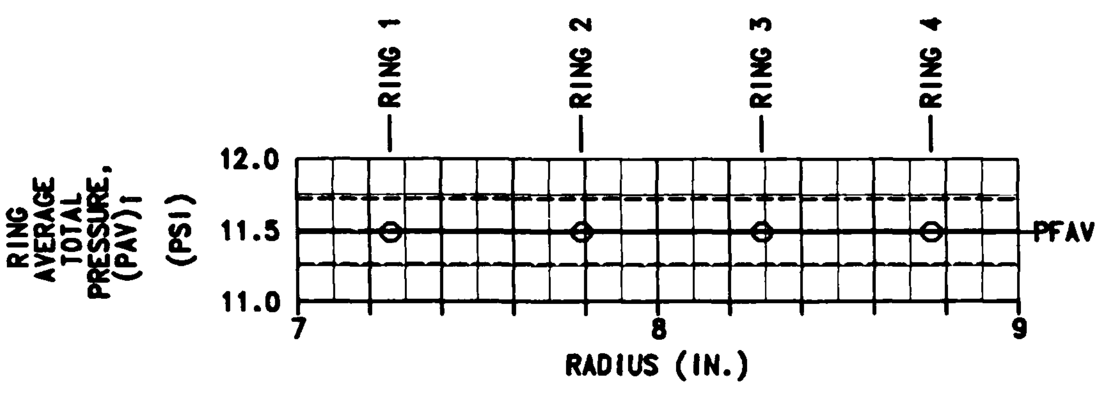


FIGURE E-31

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

LEVEL BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9120	138.0	0.0	5810	10.5	310	93	1.6 UP	0.5 LT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

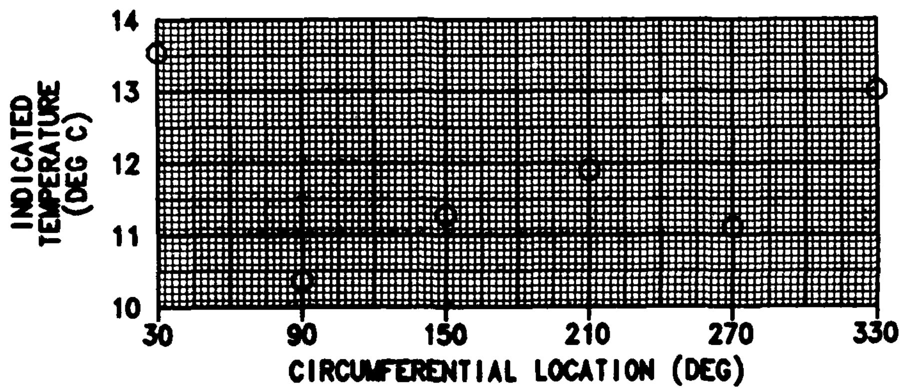


FIGURE E-32

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9090	138.7	0.0	6230	6.0	324	91	1.2 DN	0.3 RT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

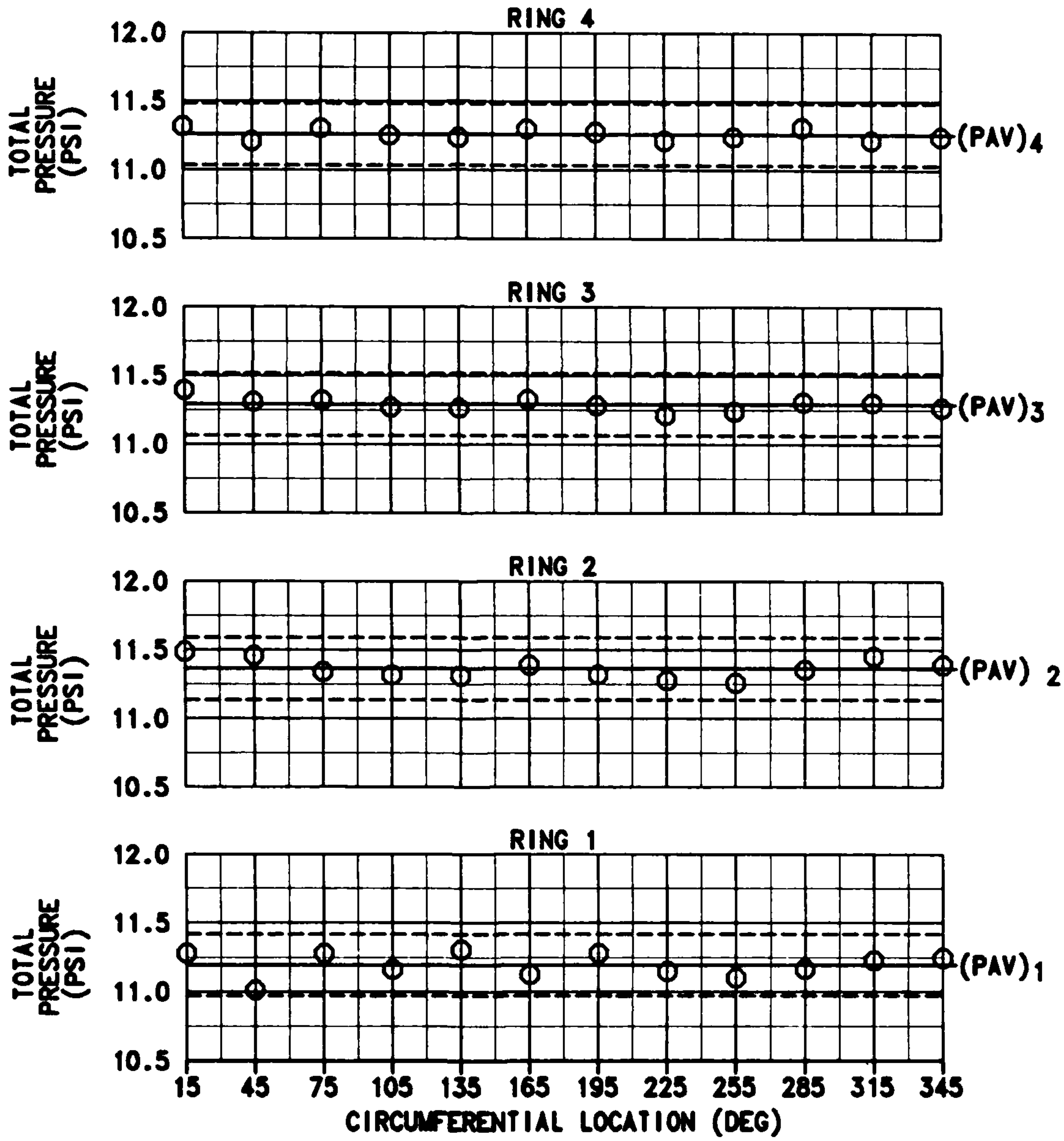


FIGURE E-33

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9090	138.7	0.0	6230	6.0	324	91	1.2 DN	0.3 RT

NOTES:

1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

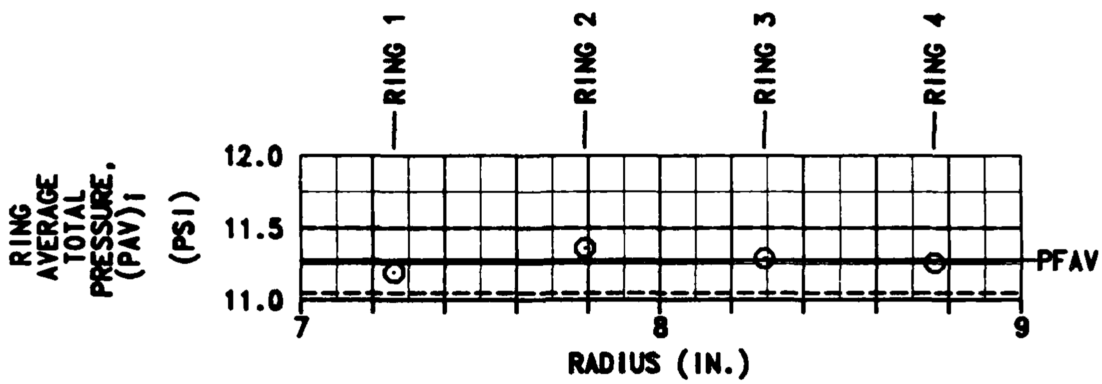


FIGURE E-34

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9090	138.7	0.0	6230	6.0	324	91	1.2 DN	0.3 RT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

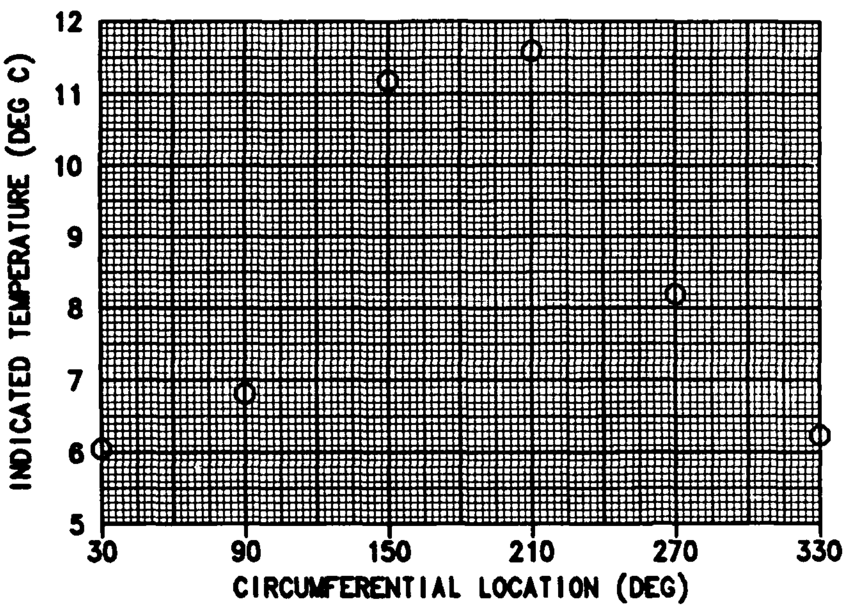


FIGURE E-35

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9000	137.6	0.0	5820	10.5	322	92	2.1 DN	1.1 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

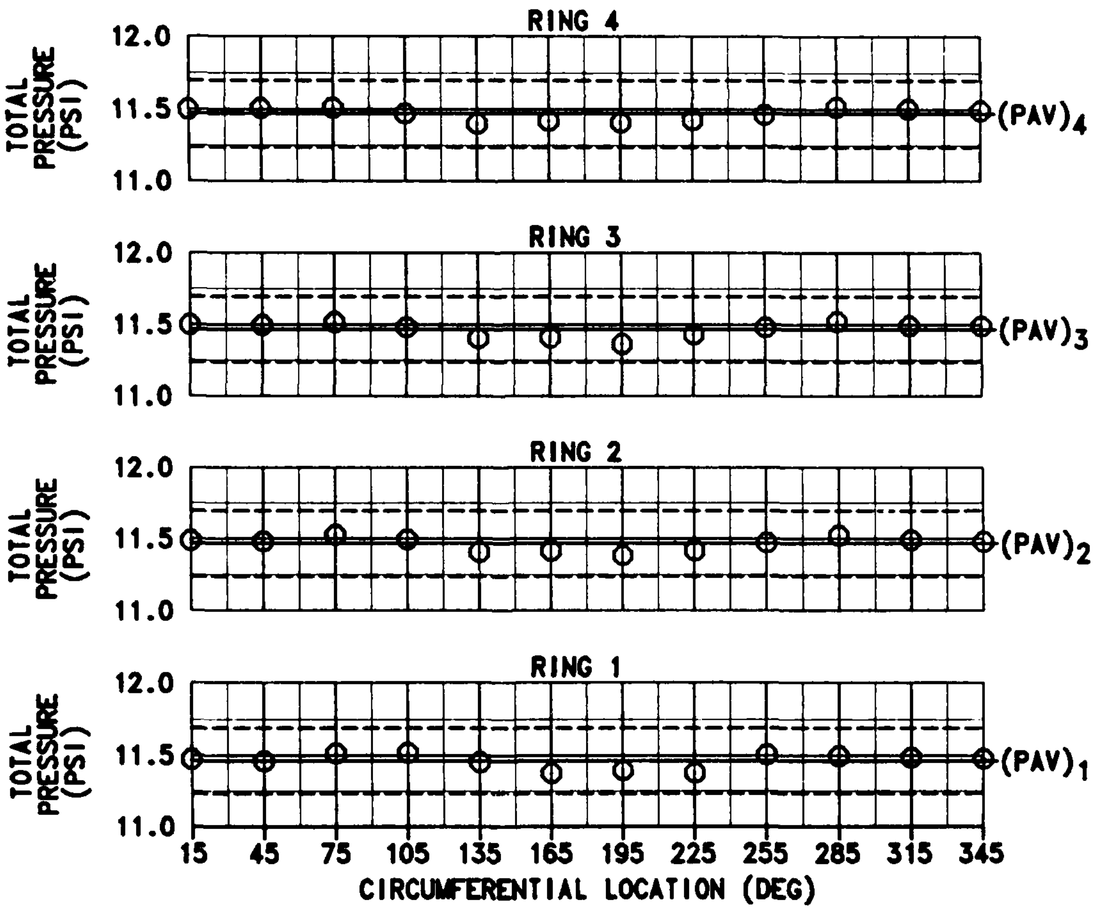


FIGURE E-36

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9000	137.6	0.0	5820	10.5	322	92	2.1 DN	1.1 LT

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE:
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

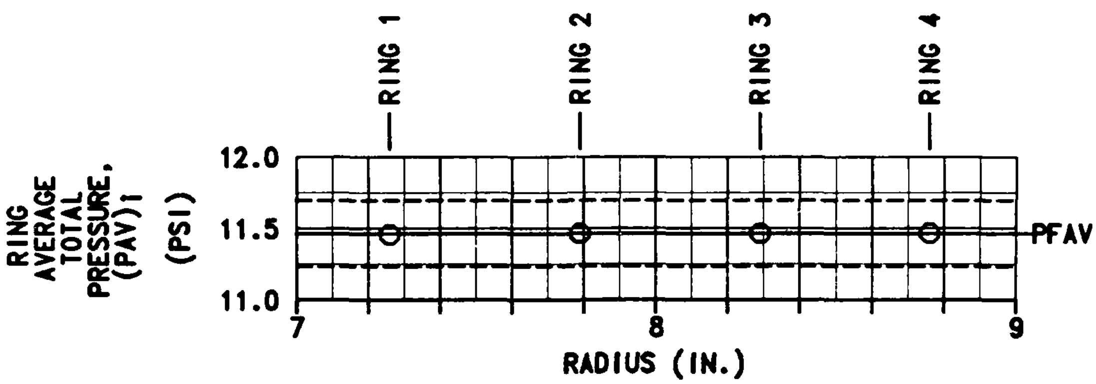


FIGURE E-37

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
CLIMBING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9000	137.6	0.0	5820	10.5	322	92	2.1 DN	1.1 LT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

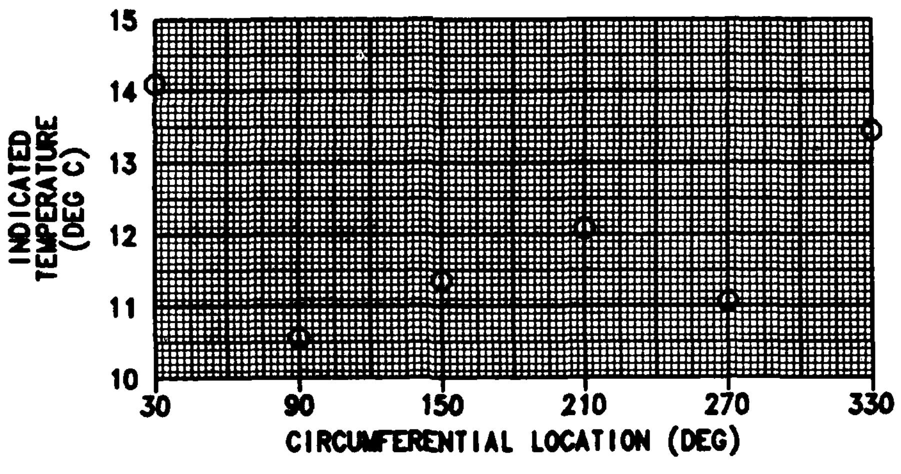


FIGURE E-38

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9040	138.6	0.0	6660	5.0	326	92	9.1 UP	0.5 RT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

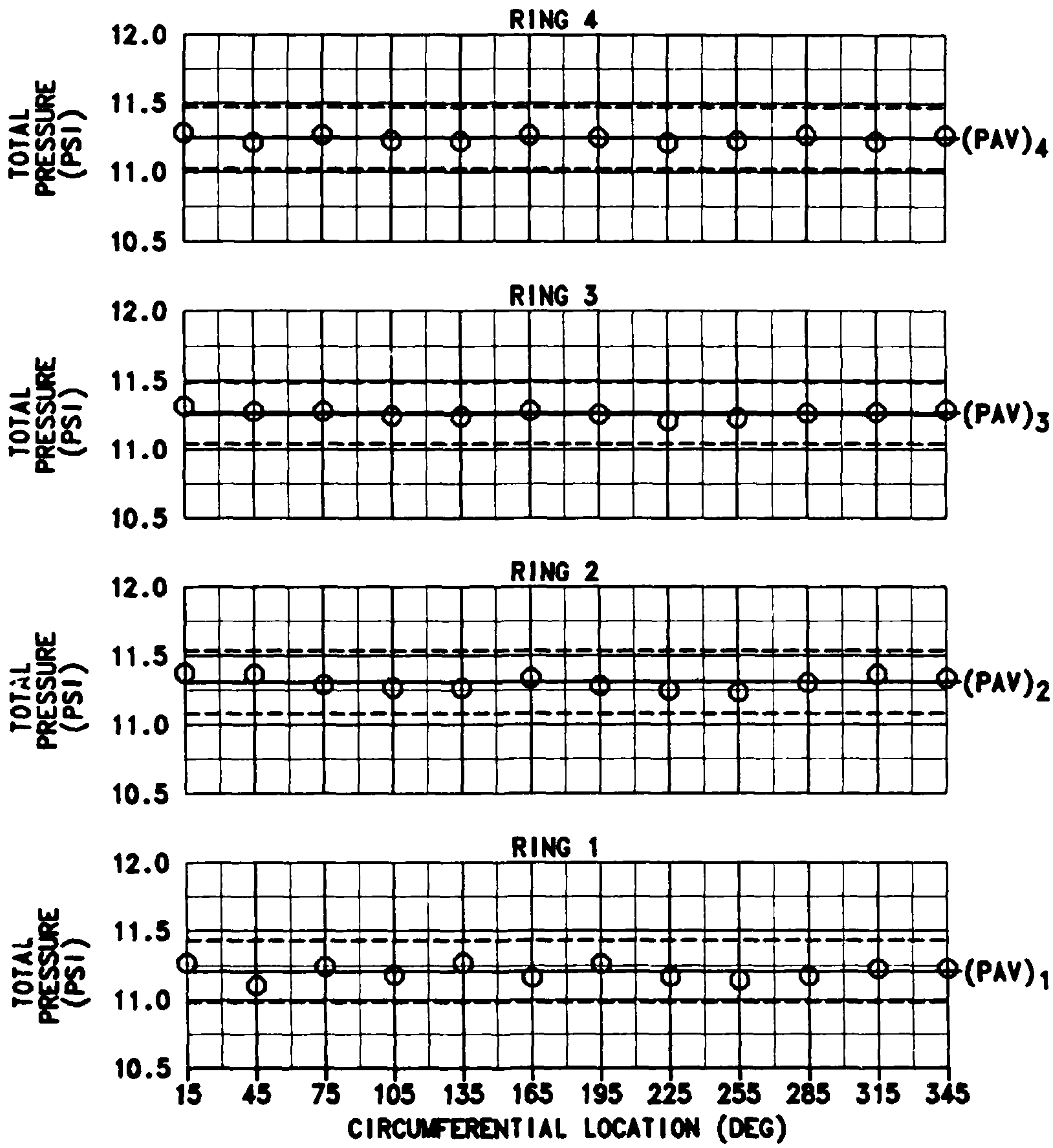


FIGURE E-39

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9040	138.6	0.0	6660	5.0	326	92	9.1 UP	0.5 RT

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
PFAV = [(PAV)$_1$ + (PAV)$_2$ + (PAV)$_3$ + (PAV)$_4$]/4.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

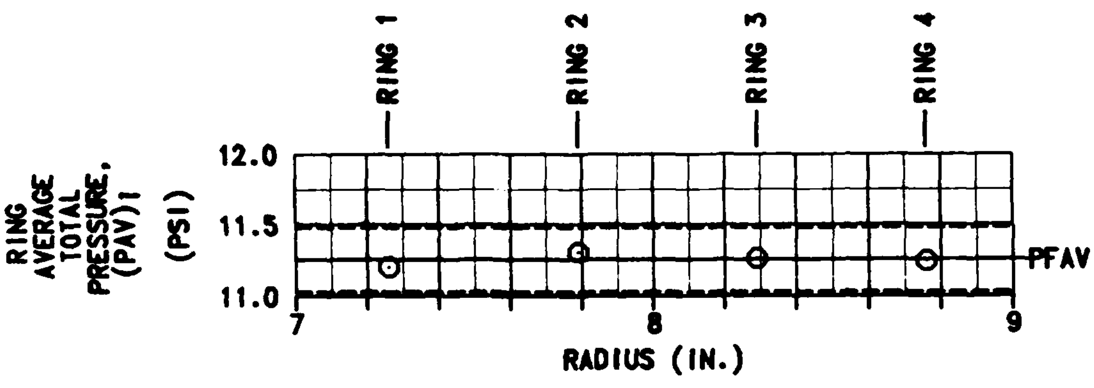


FIGURE E-40

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
9040	138.6	0.0	6660	5.0	326	92	9.1 UP	0.5 RT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

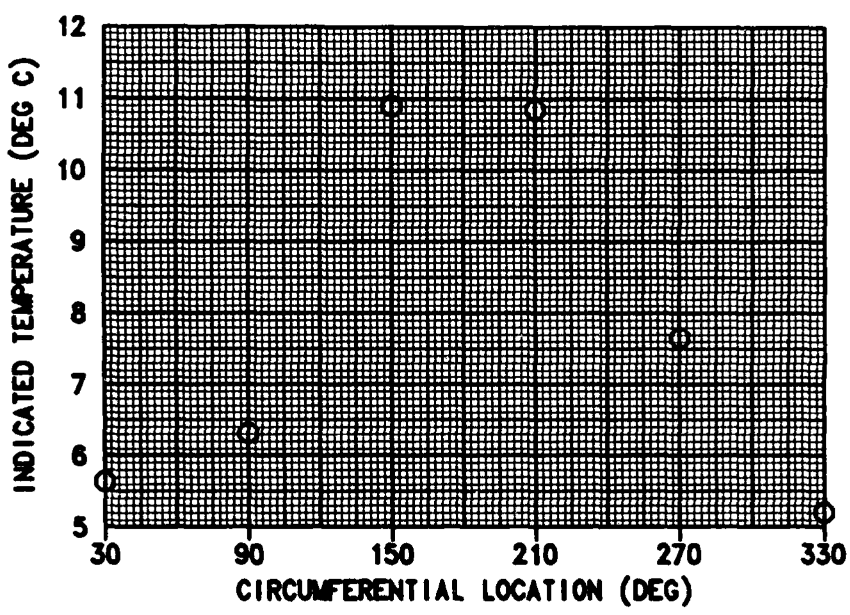


FIGURE E-41

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8980	137.6	0.0	5630	10.5	326	93	10.2 UP	1.9 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

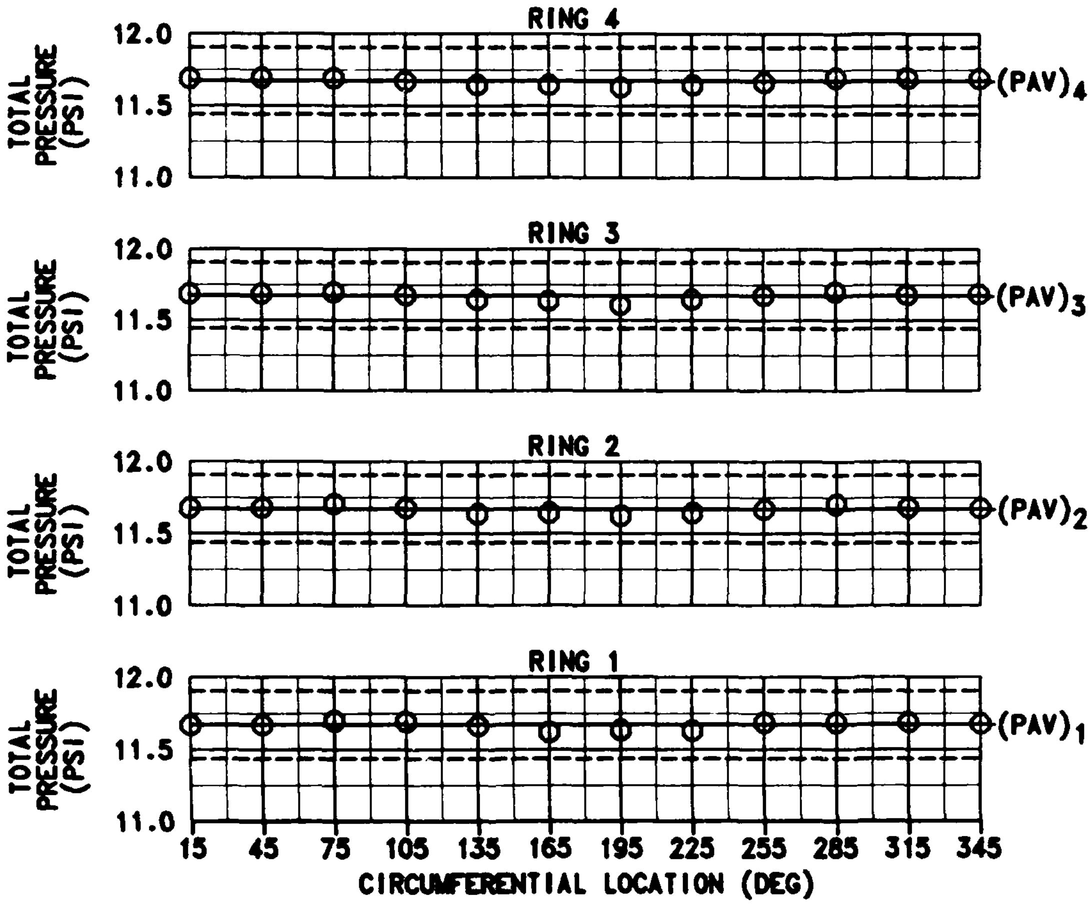


FIGURE E-42

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8980	137.6	0.0	5630	10.5	326	93	10.2 UP	1.9 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

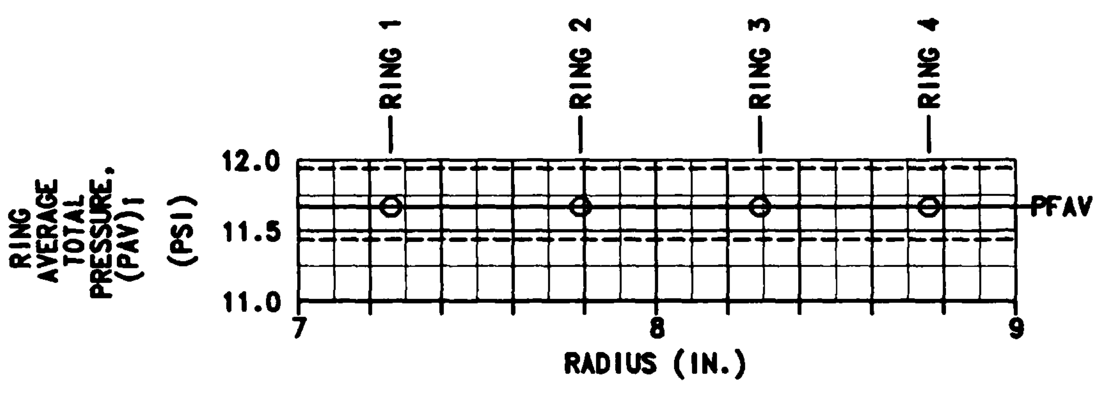


FIGURE E-43

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
DESCENDING BALL-CENTERED FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8980	137.6	0.0	5630	10.5	326	93	10.2 UP	1.9 LT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

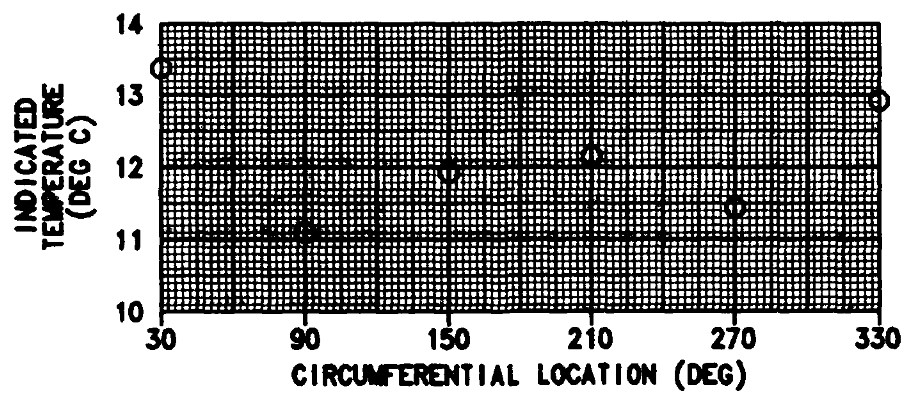


FIGURE E-44

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8950	138.3	0.0	6050	6.5	321	92	16.6 UP	0.7 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

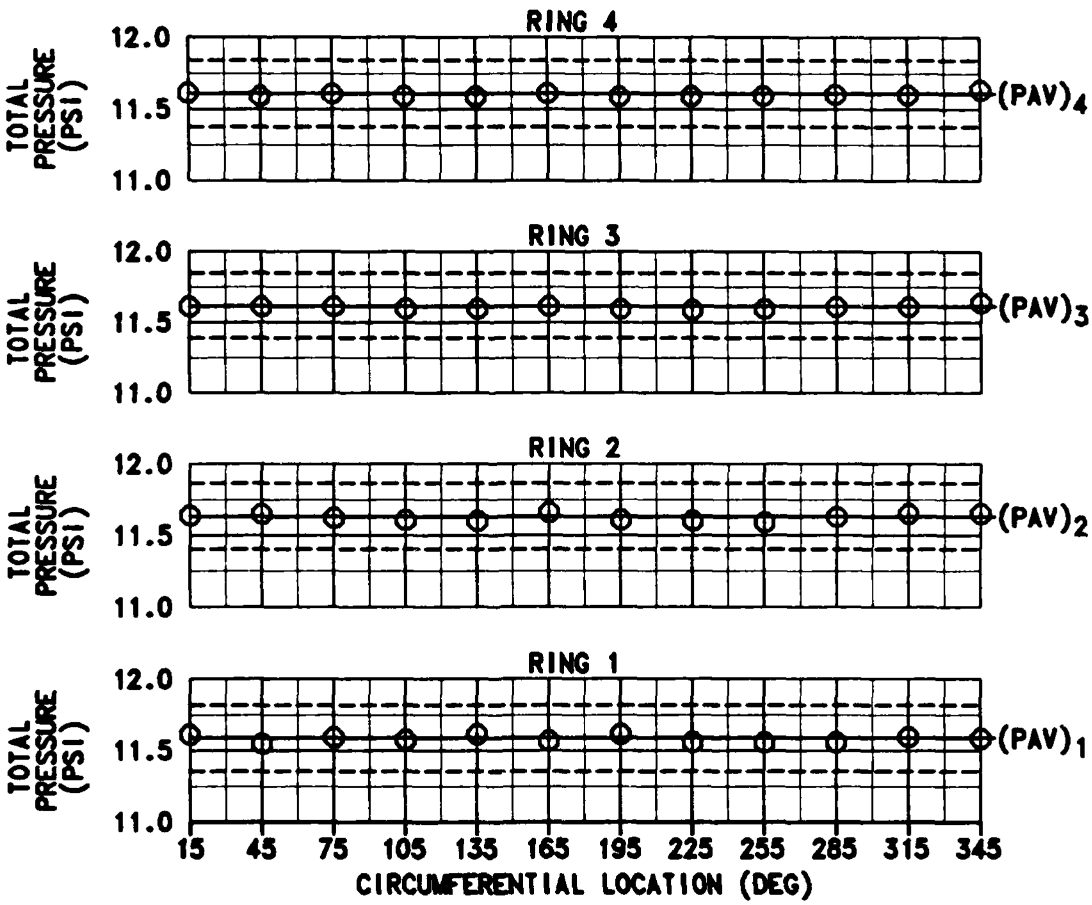


FIGURE E-45

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8950	138.3	0.0	6050	6.5	321	92	16.6 UP	0.7 LT

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

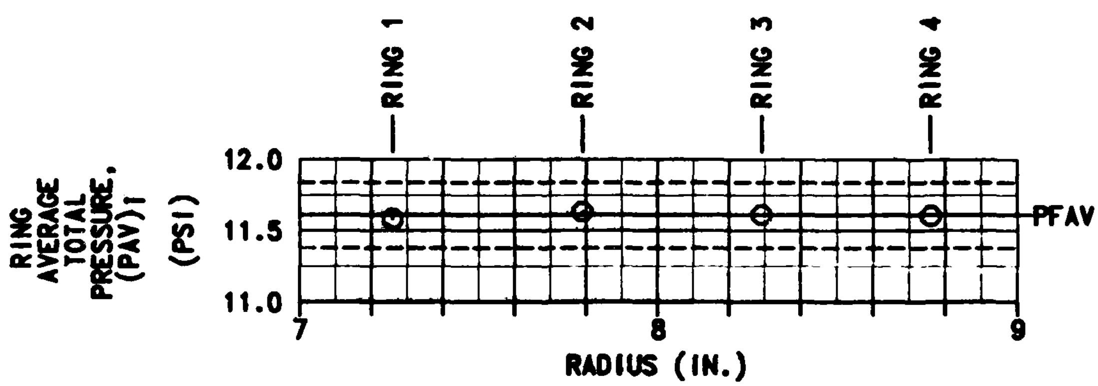


FIGURE E-46

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8950	138.3	0.0	6050	6.5	321	92	16.6 UP	0.7 LT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

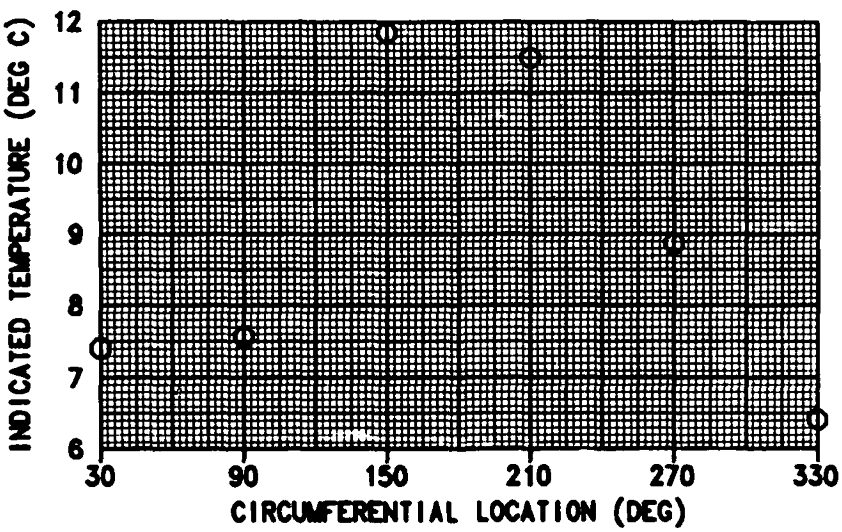


FIGURE E-47

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8880	137.2	0.0	6390	9.0	307	92	14.9 UP	5.5 LT

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

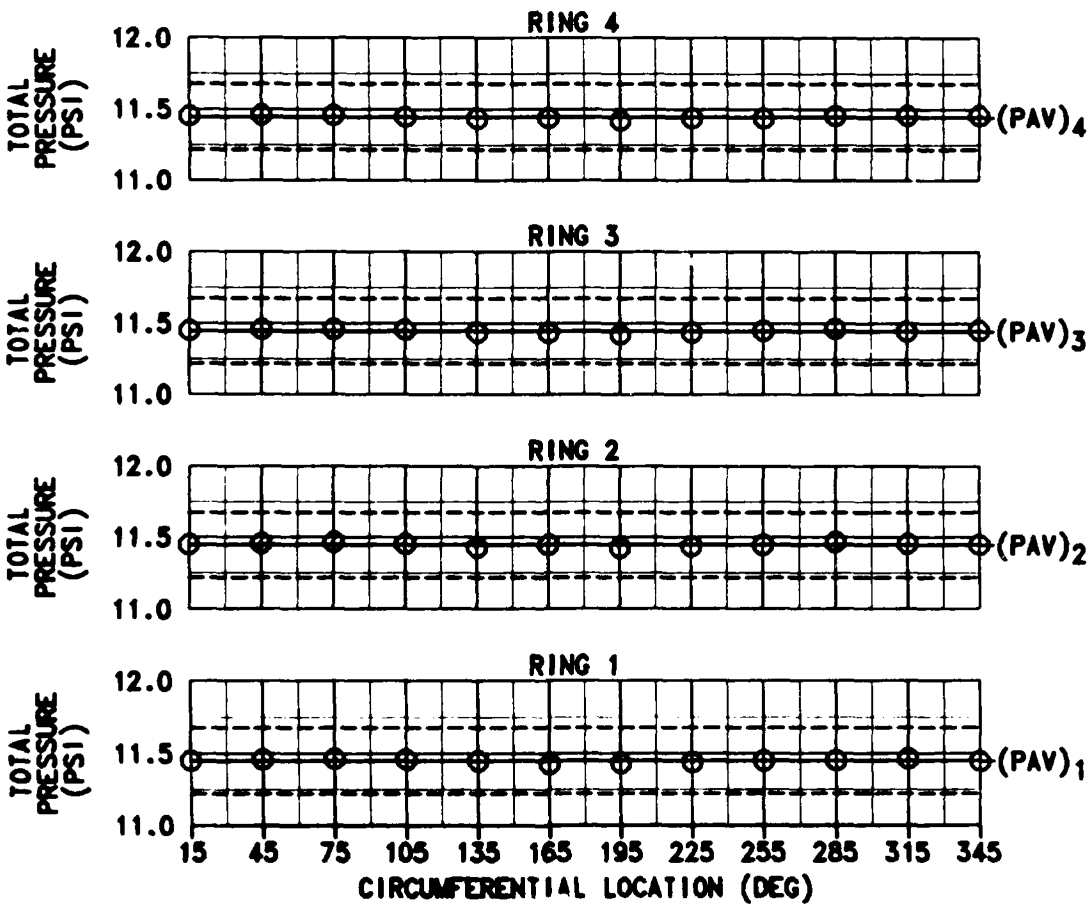


FIGURE E-48

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8880	137.2	0.0	6390	9.0	307	92	14.9 UP	5.5 LT

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

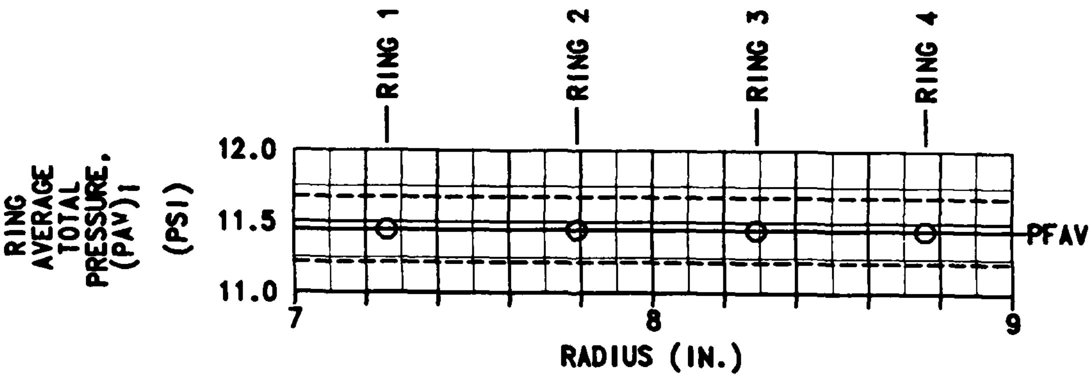


FIGURE E-49

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

AUTOROTATION

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)	AVG ANGLE OF SIDESLIP (DEG)
8880	137.2	0.0	6390	9.0	307	92	14.9 UP	5.5 LT

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

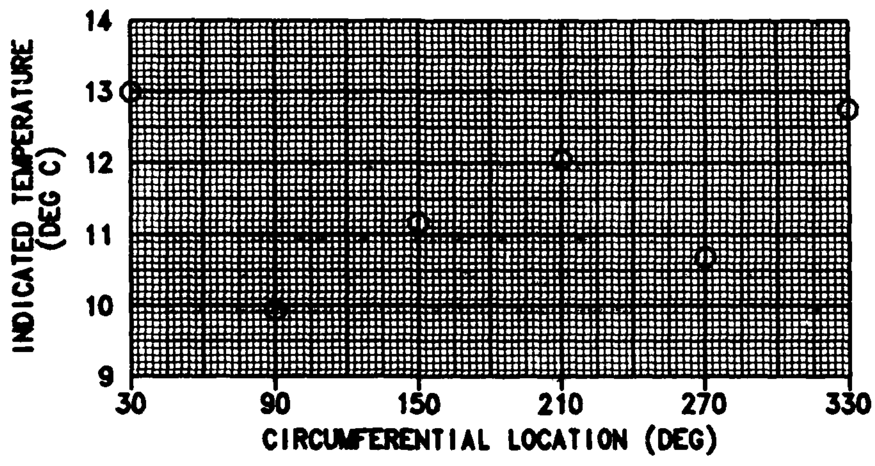


FIGURE E-50

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 14.8-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8840	137.9	0.0	6090	6.0	323	91	1.7 DN

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

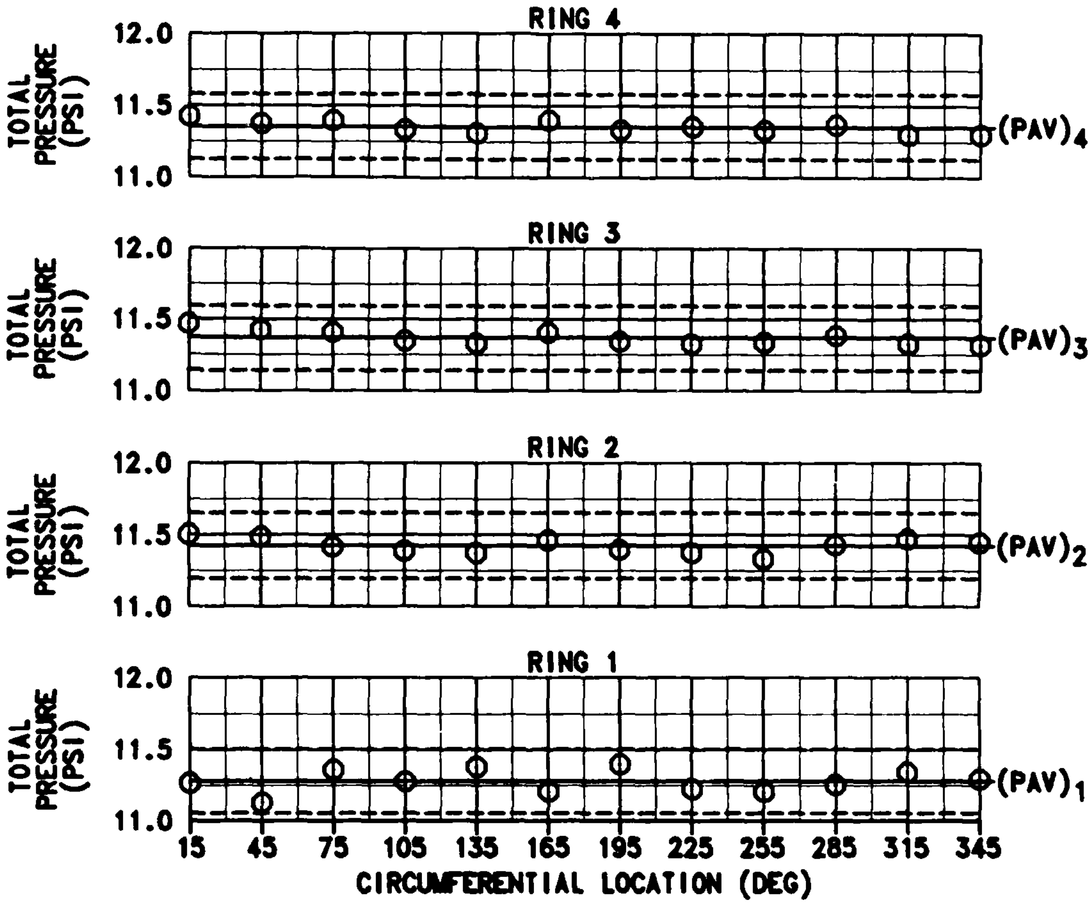


FIGURE E-51

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 14.8-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8840	137.9	0.0	6090	6.0	323	91	1.7 DN

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE: PFAV = [(PAV)$_1$ + (PAV)$_2$ + (PAV)$_3$ + (PAV)$_4$]/4.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

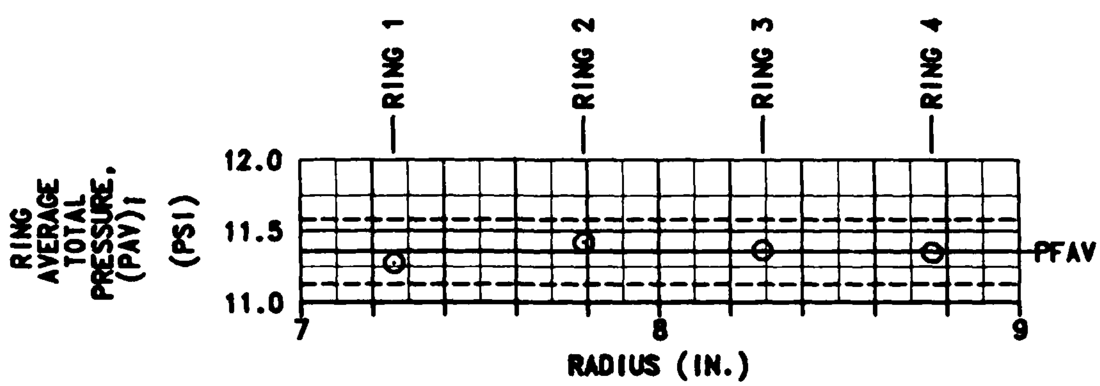


FIGURE E-52

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 14.8-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8840	137.9	0.0	6090	6.0	323	91	1.7 DN

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

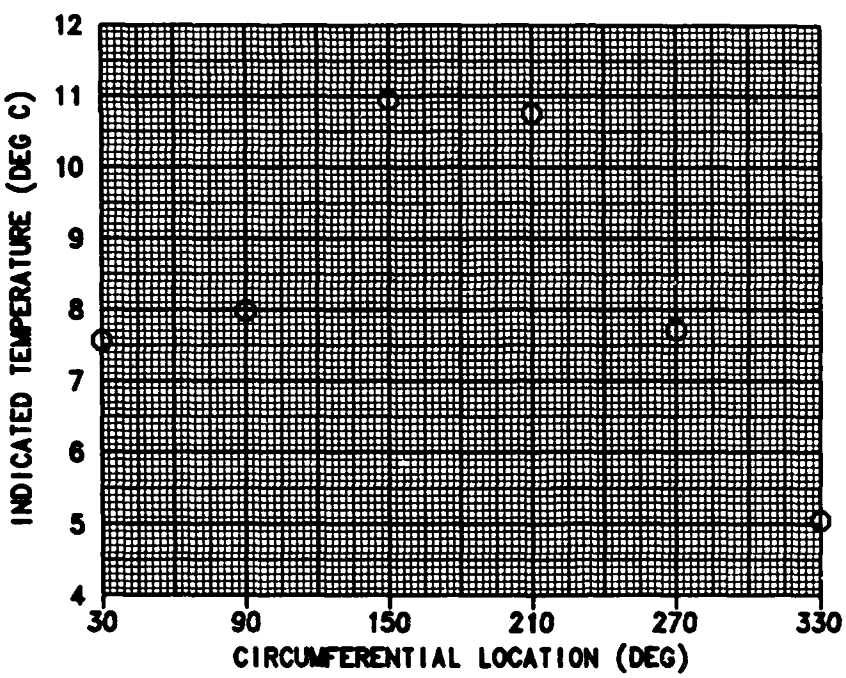


FIGURE E-53

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 15.0-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8770	136.6	0.0	5970	10.5	323	92	1.1 DN

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

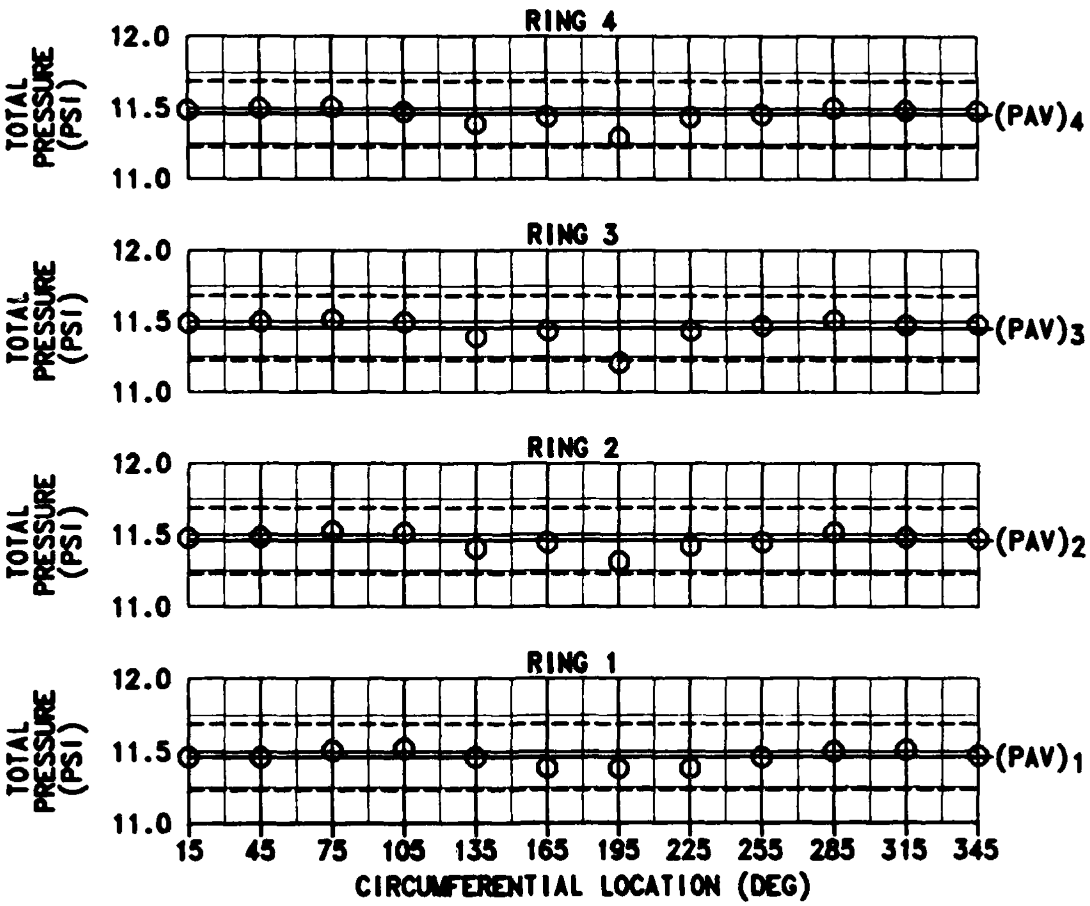


FIGURE E-54

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 15.0-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8770	136.6	0.0	5970	10.5	323	92	1.1 DN

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

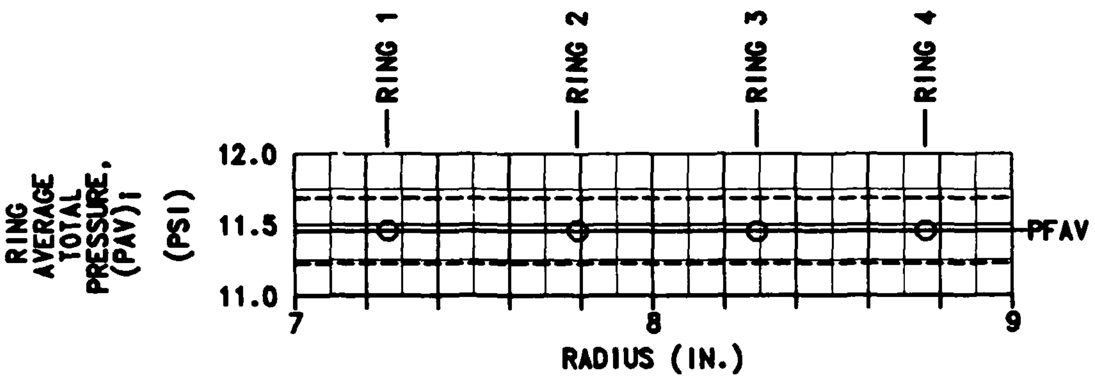


FIGURE E-55

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

LEVEL FLIGHT WITH 15.0-DEGREE LEFT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8770	136.6	0.0	5970	10.5	323	92	1.1 DN

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

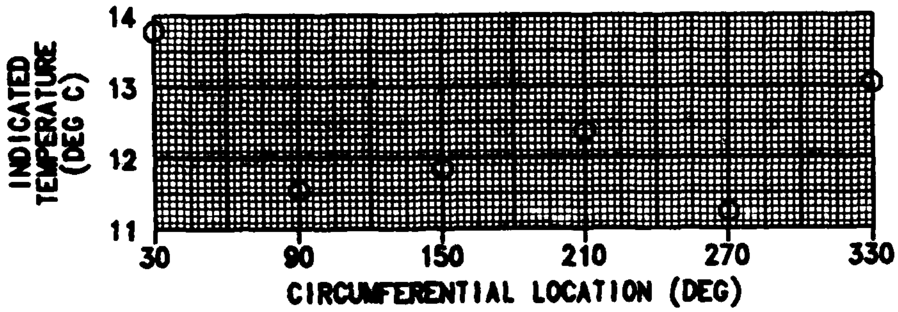


FIGURE E-56

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LEVEL FLIGHT WITH 16.9-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8890	138.1	0.0	6080	6.0	323	92	1.2 UP

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

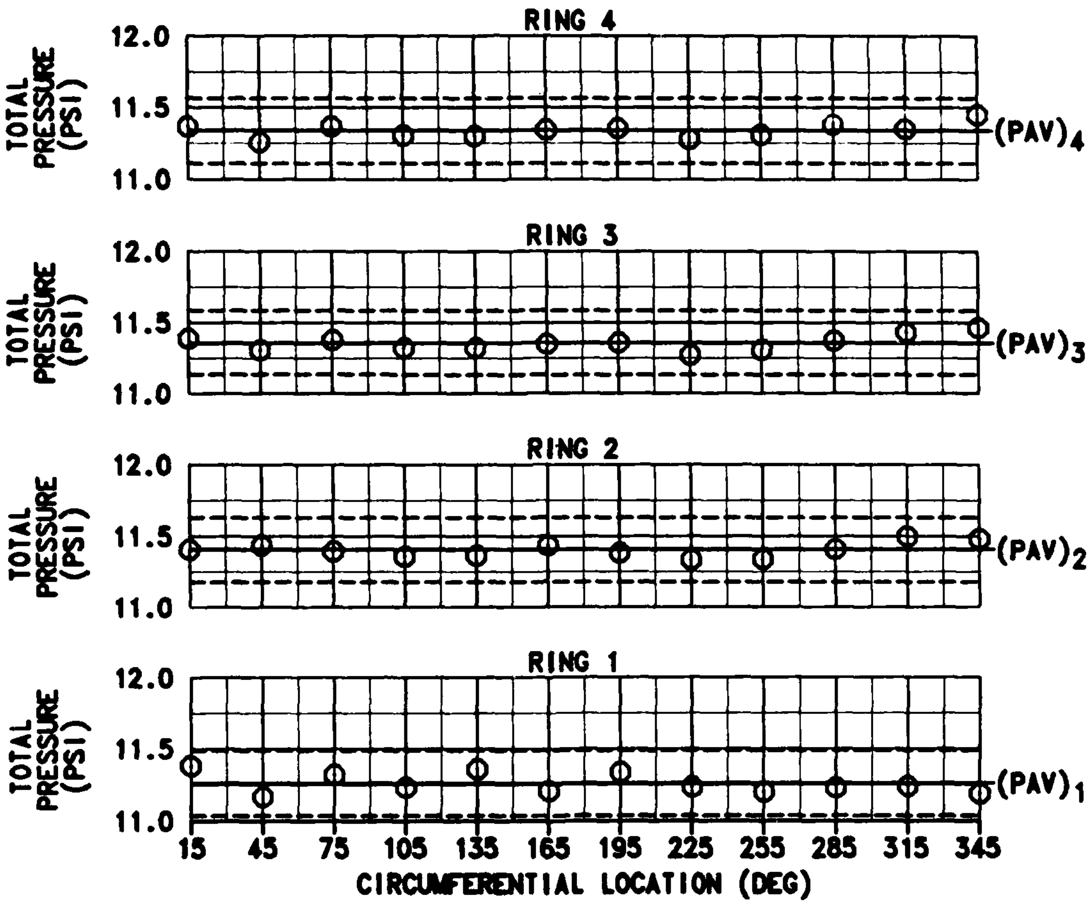


FIGURE E-57

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 16.9-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8890	138.1	0.0	6080	6.0	323	92	1.2 UP

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

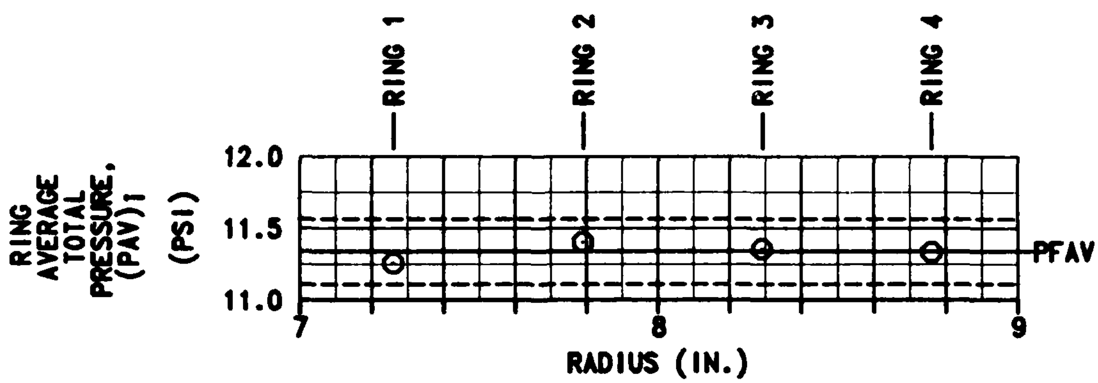


FIGURE E-58

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 16.9-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8890	138.1	0.0	6080	6.0	323	92	1.2 UP

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

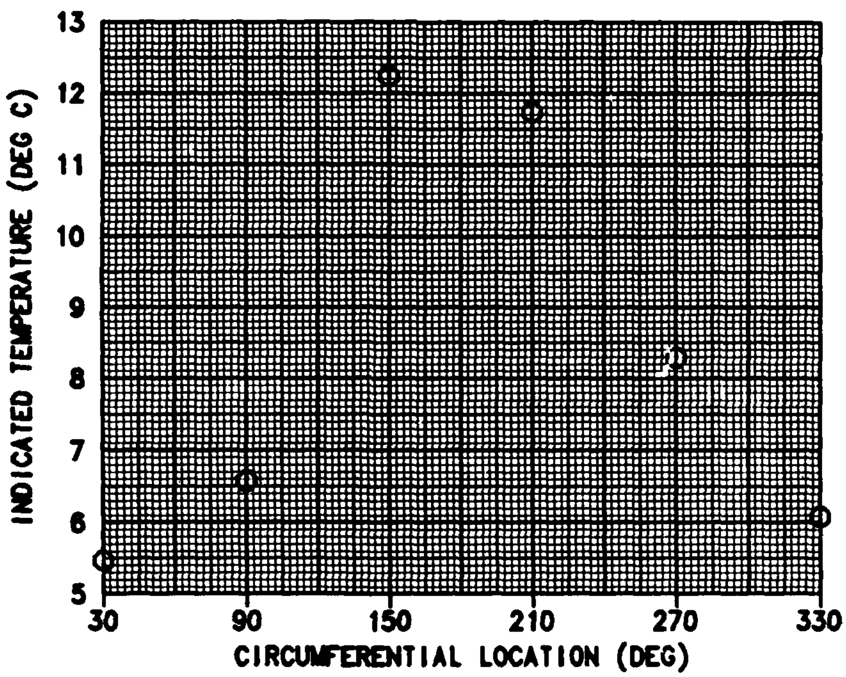


FIGURE E-59

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 16.0-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8810	136.8	0.0	6460	9.0	322	90	0.6 UP

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

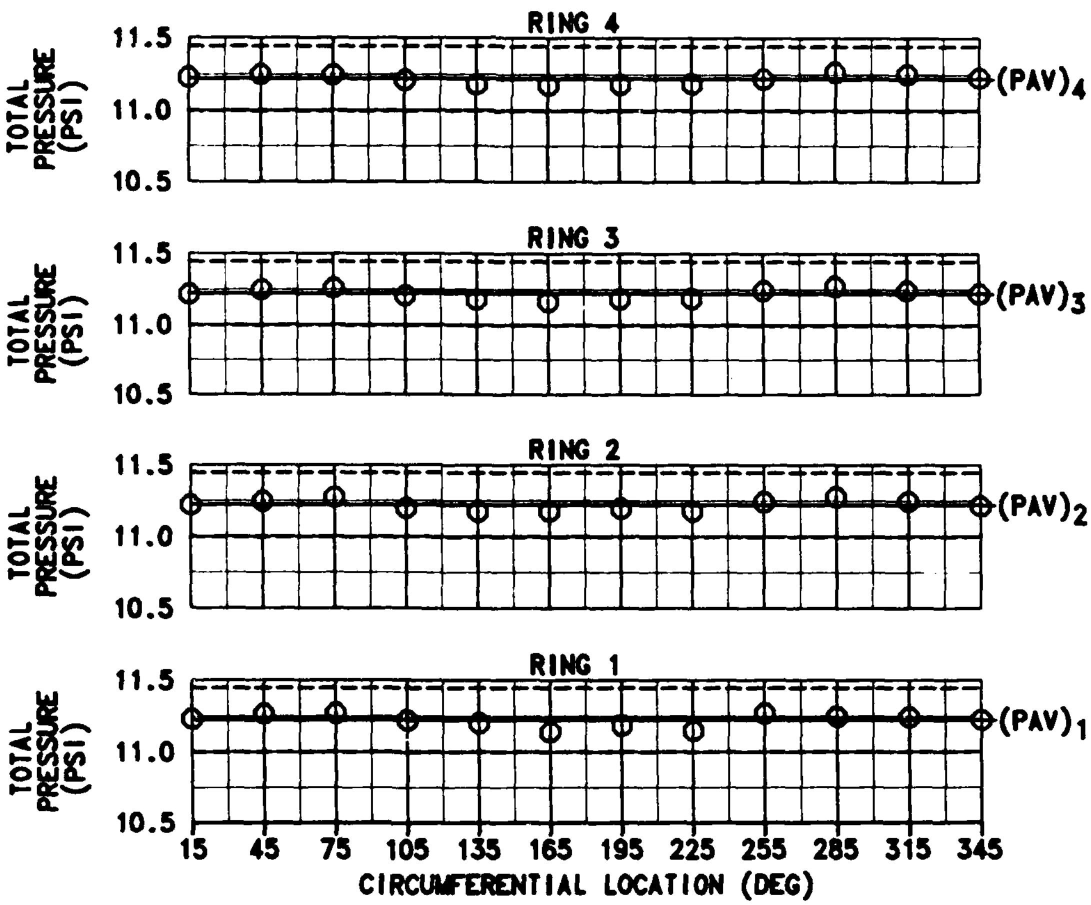


FIGURE E-60

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 16.0-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8810	136.8	0.0	6460	9.0	322	90	0.6 UP

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
$PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

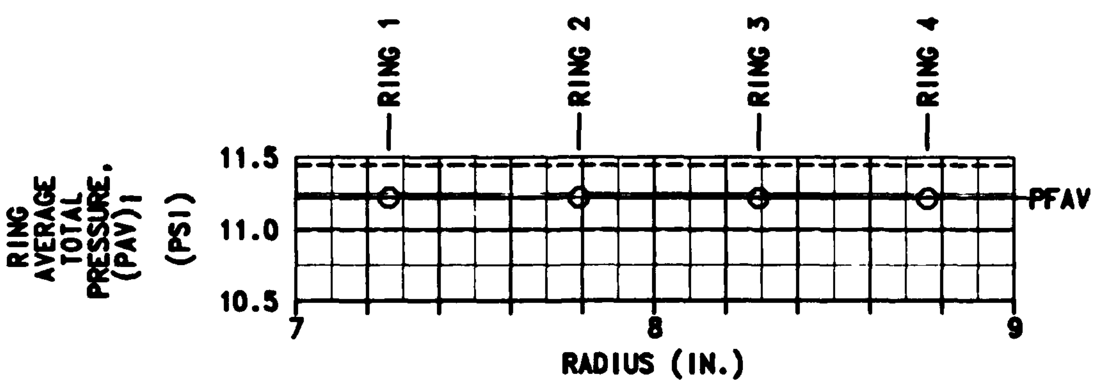


FIGURE E-61

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
LEVEL FLIGHT WITH 16.0-DEGREE RIGHT SIDESLIP

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG TRIM CALIBRATED AIRSPEED (KTS)	AVG ANGLE OF ATTACK (DEG)
8810	136.8	0.0	6460	9.0	322	90	0.6 UP

NOTE: RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

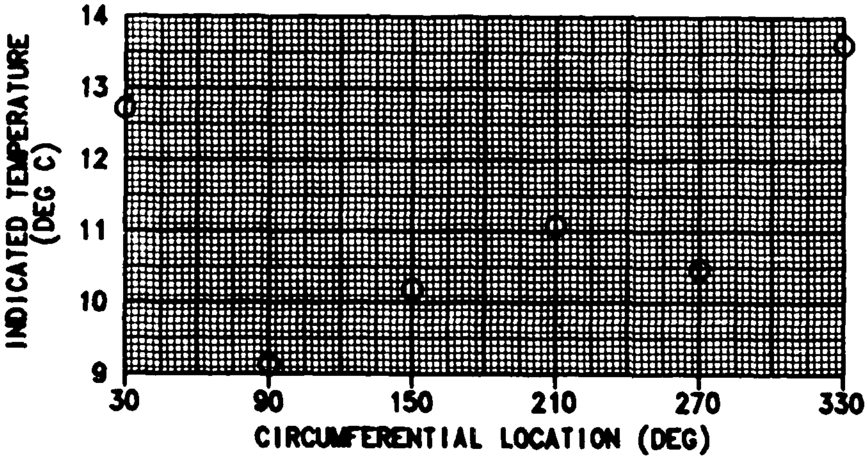


FIGURE E-62

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 0-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8960	137.8	0.0	2210	21.5	324	10	29.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

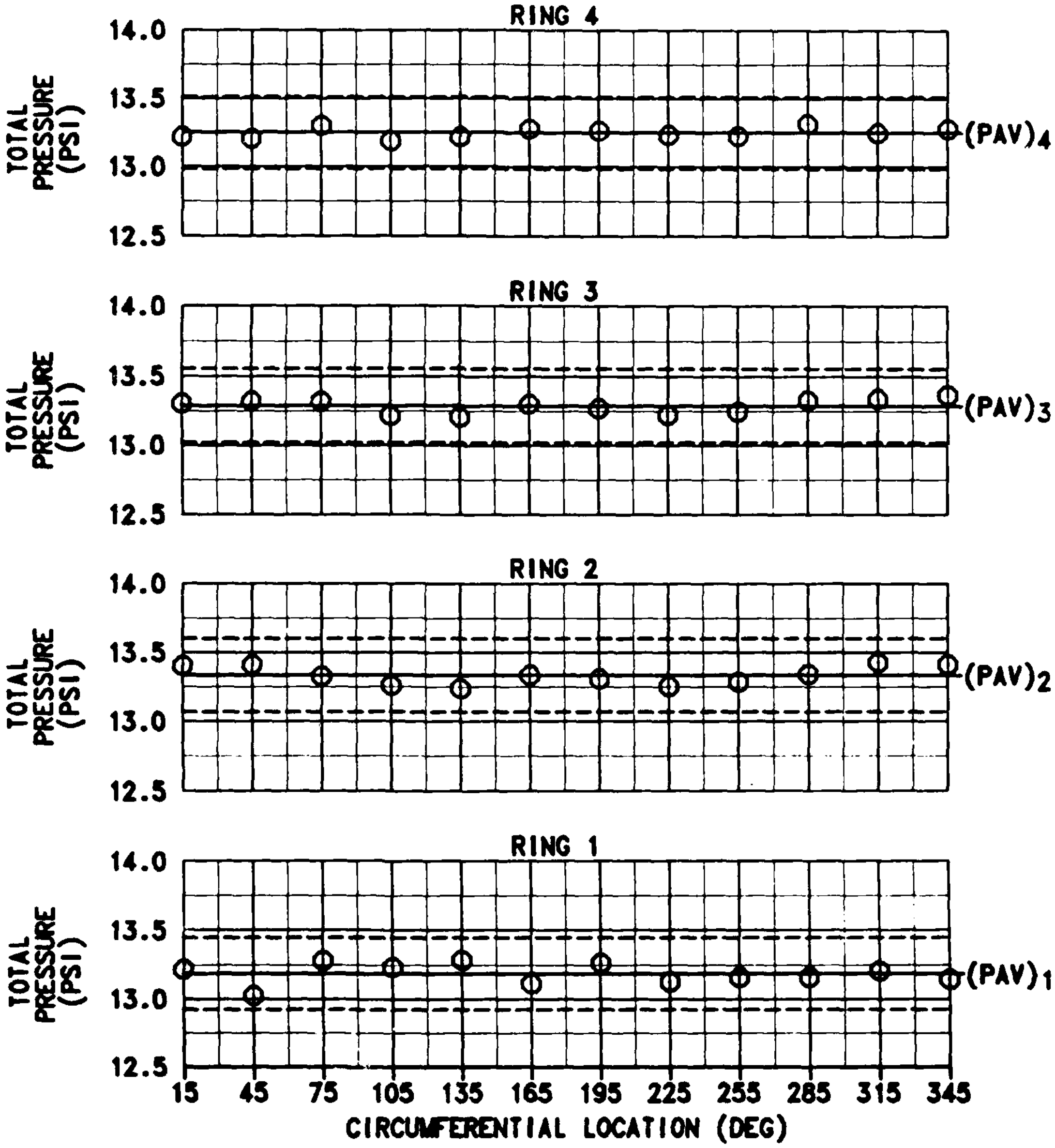


FIGURE E-63

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 0-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	AVG CG LOCATION LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8960	137.8	0.0	2210	21.5	324	10	29.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

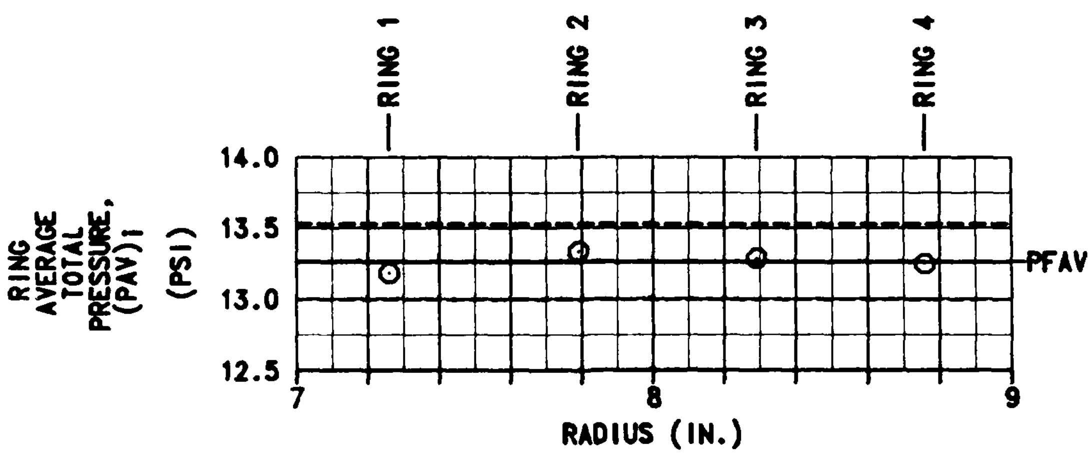


FIGURE E-64

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 0-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8990	138.0	0.0	2220	8.5	322	6	30.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

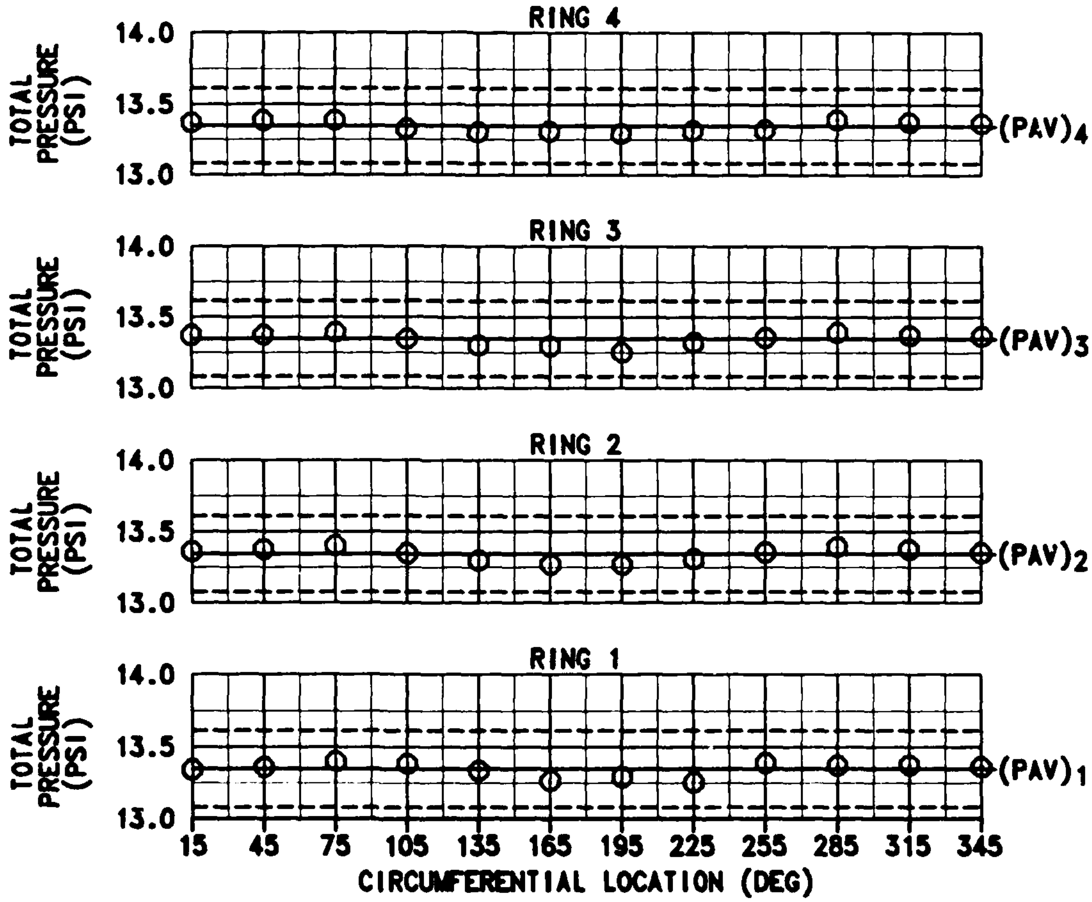


FIGURE E-65

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 0-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8990	138.0	0.0	2220	8.5	322	6	30.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

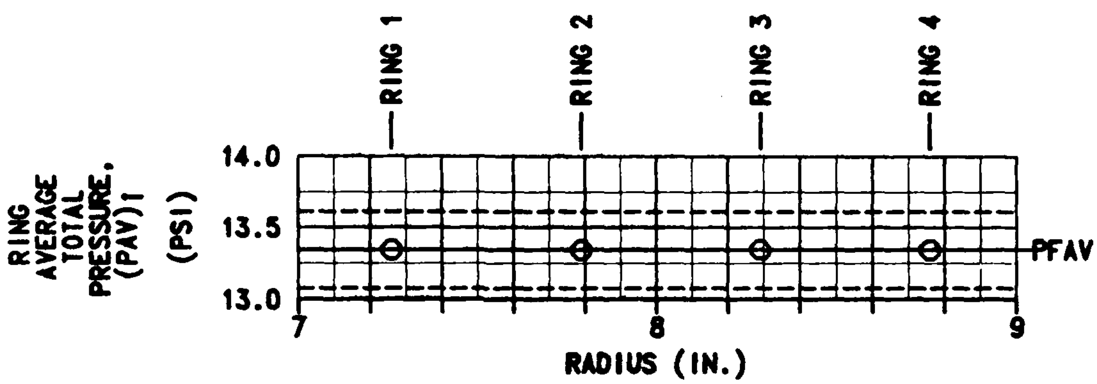


FIGURE E-66

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 90-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8860	137.5	0.0	2220	19.0	323	12	30.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

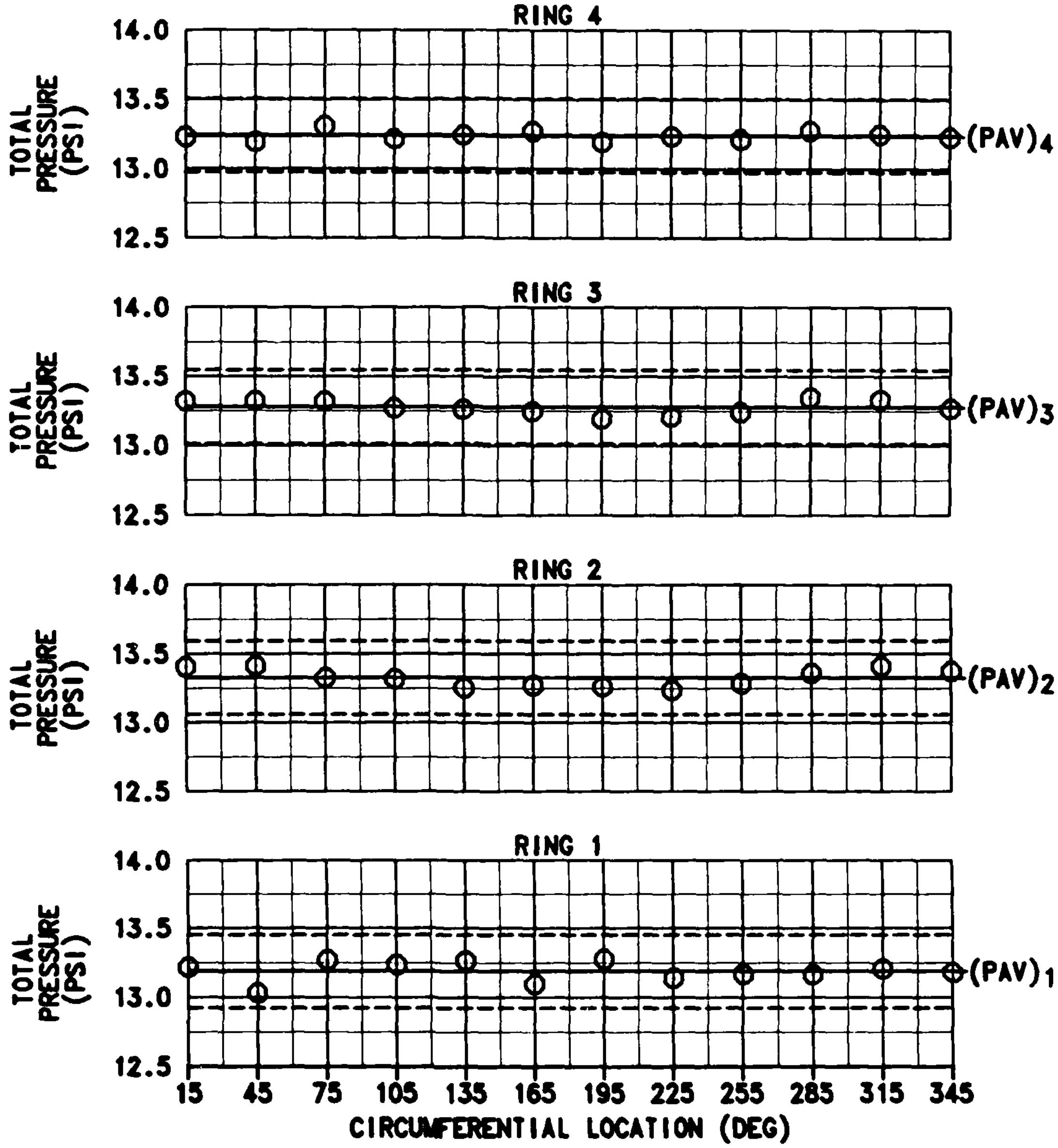


FIGURE E-67

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 90-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8860	137.5	0.0	2220	19.0	323	12	30.0

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
$PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

4. WINDS LESS THAN THREE KNOTS.

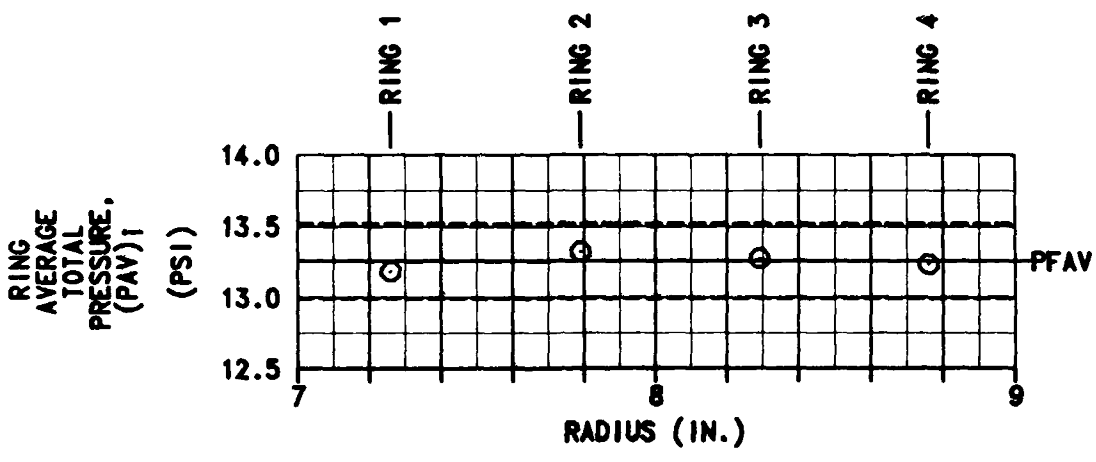


FIGURE E-68

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 90-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8850	137.5	0.0	2220	8.5	321	14	29.5

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

3. WINDS LESS THAN THREE KNOTS.

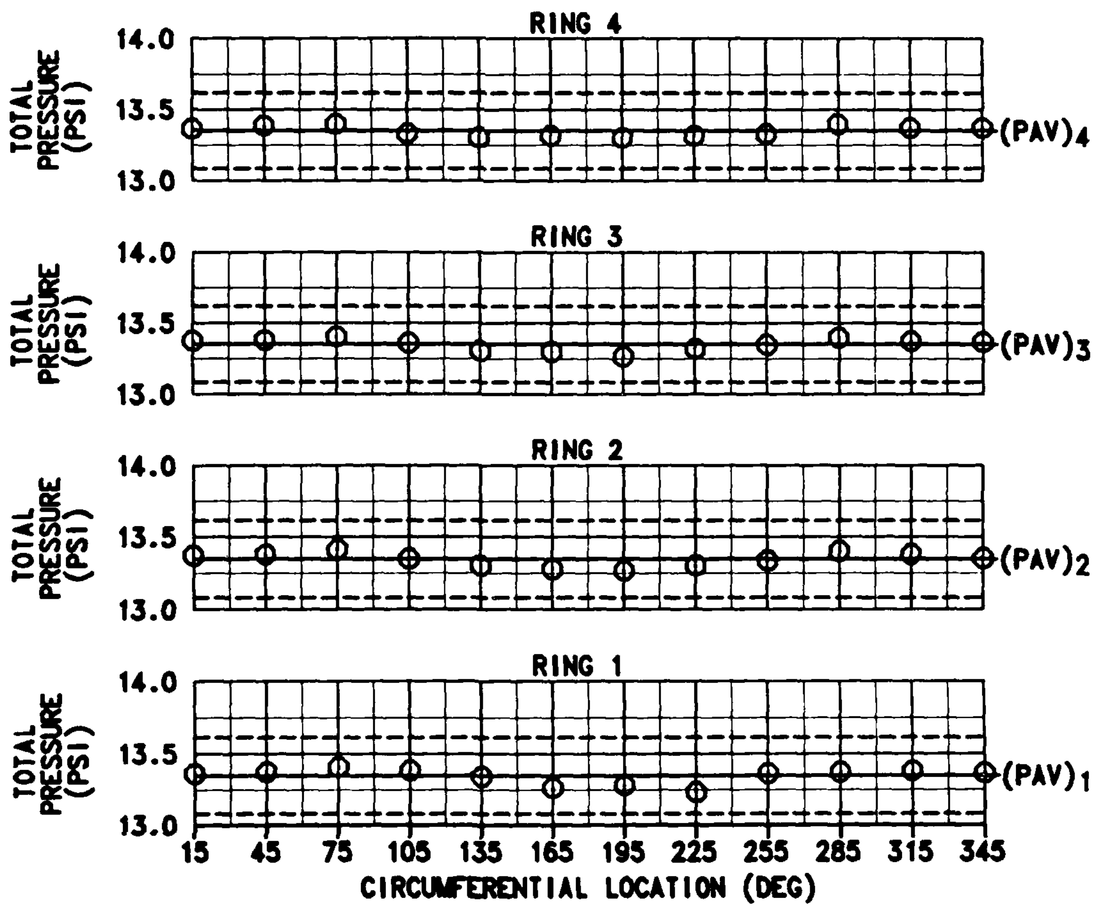


FIGURE E-69

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 90-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8850	137.5	0.0	2220	8.5	321	14	29.5

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

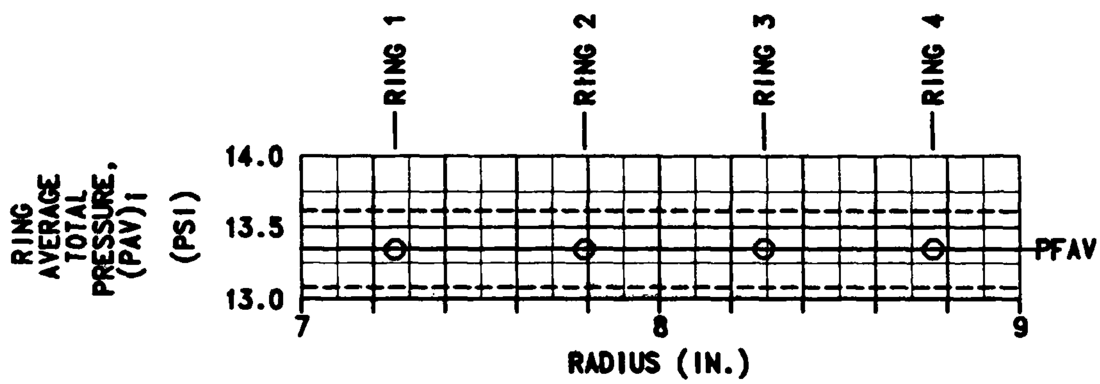


FIGURE E-70

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8790	137.3	0.0	2220	19.0	323	15	30.0

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

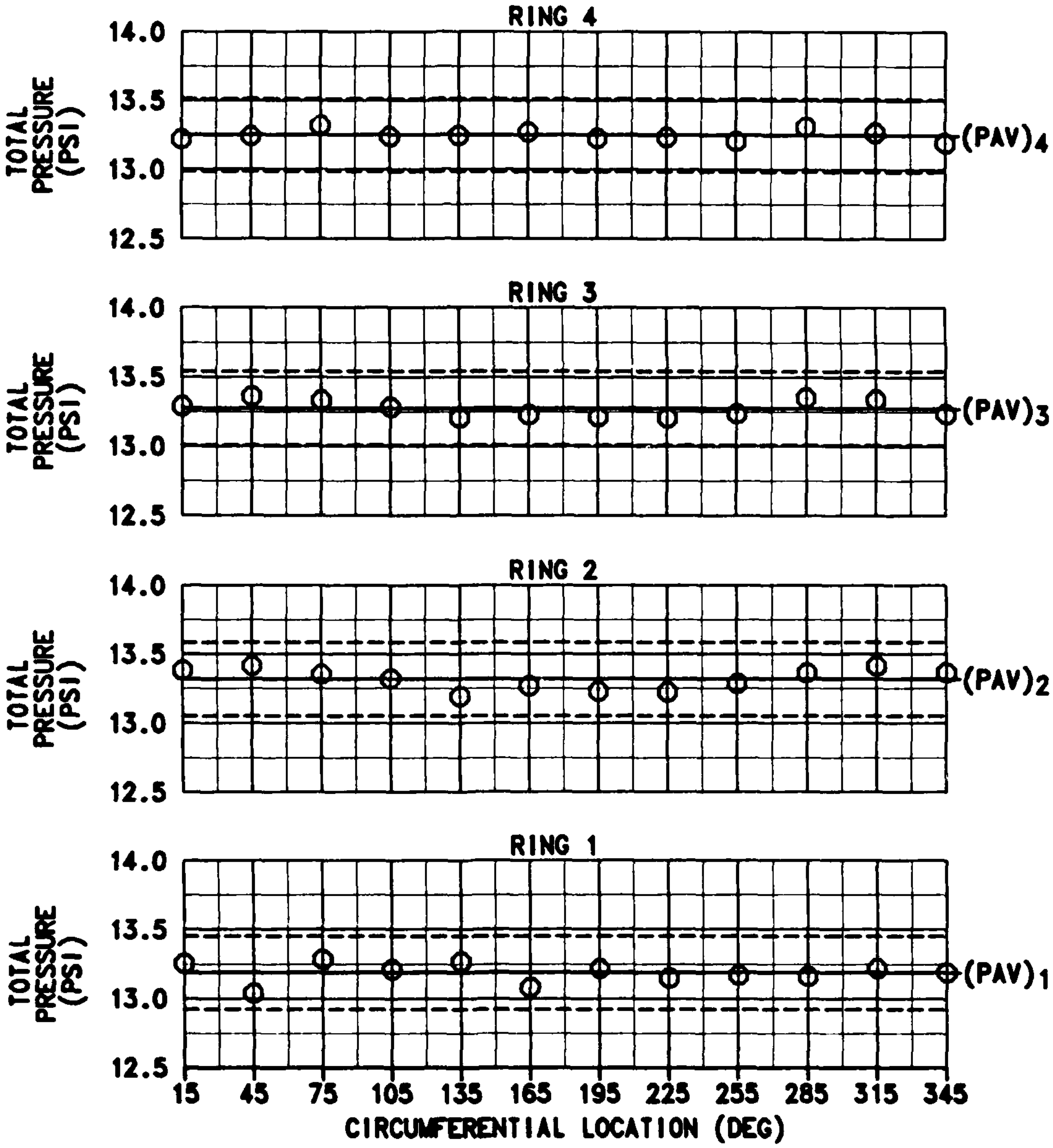


FIGURE E-71

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	AVG CG LOCATION LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8790	137.3	0.0	2220	19.0	323	15	30.0

NOTES:

1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE:
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

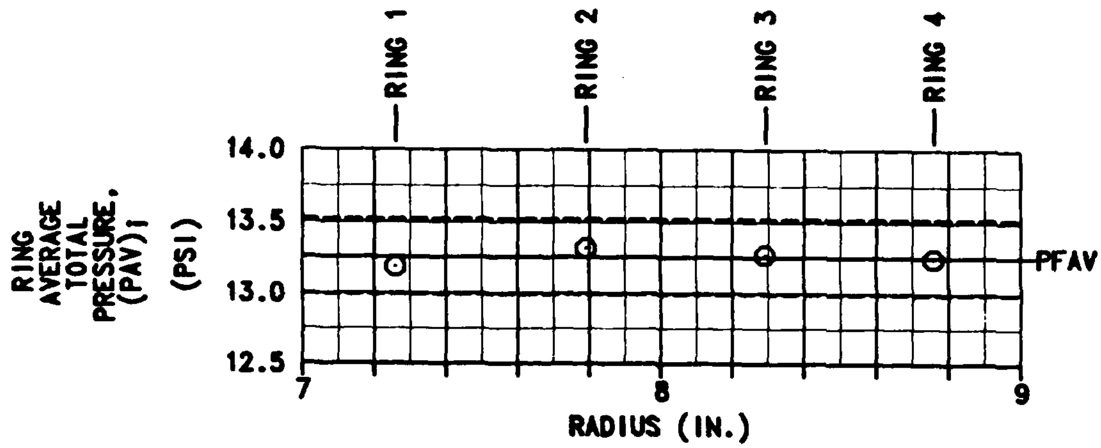


FIGURE E-72

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8790	137.3	0.0	2220	19.0	323	15	30.0

NOTES: 1. WINDS LESS THAN THREE KNOTS.
2. RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

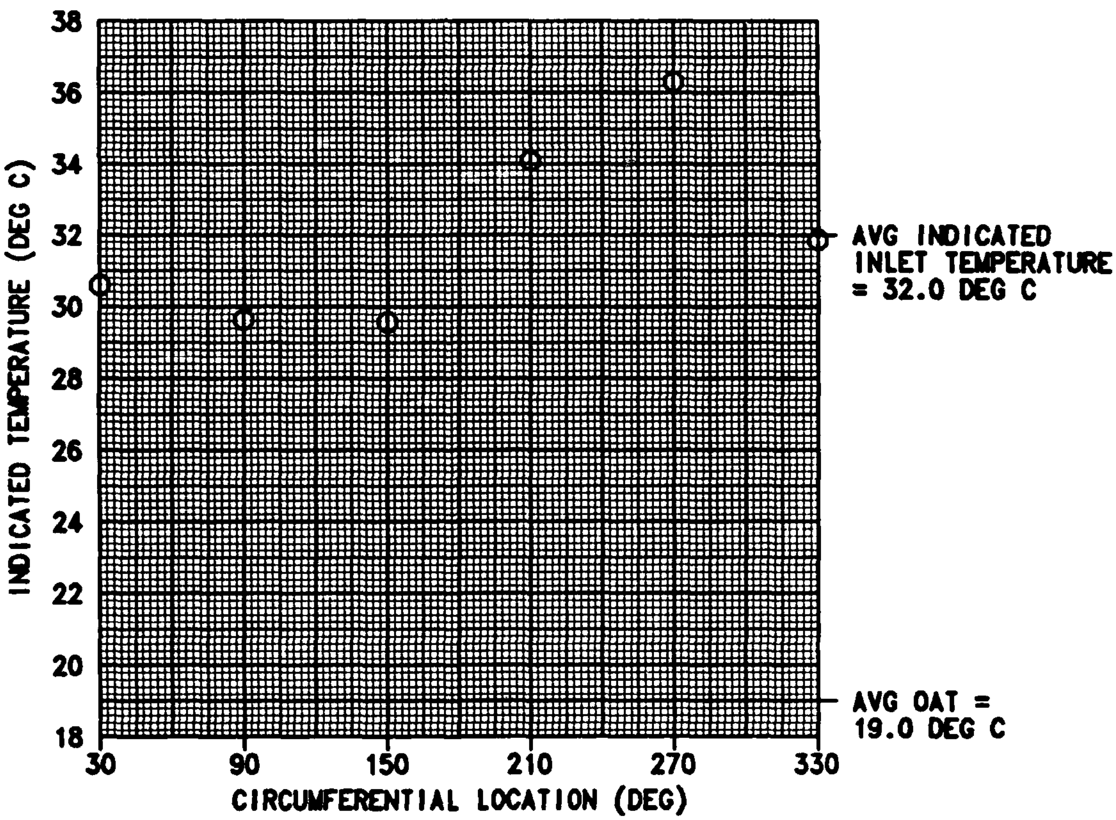


FIGURE E-73

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8800	137.3	0.0	2220	9.0	322	18	30.5

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

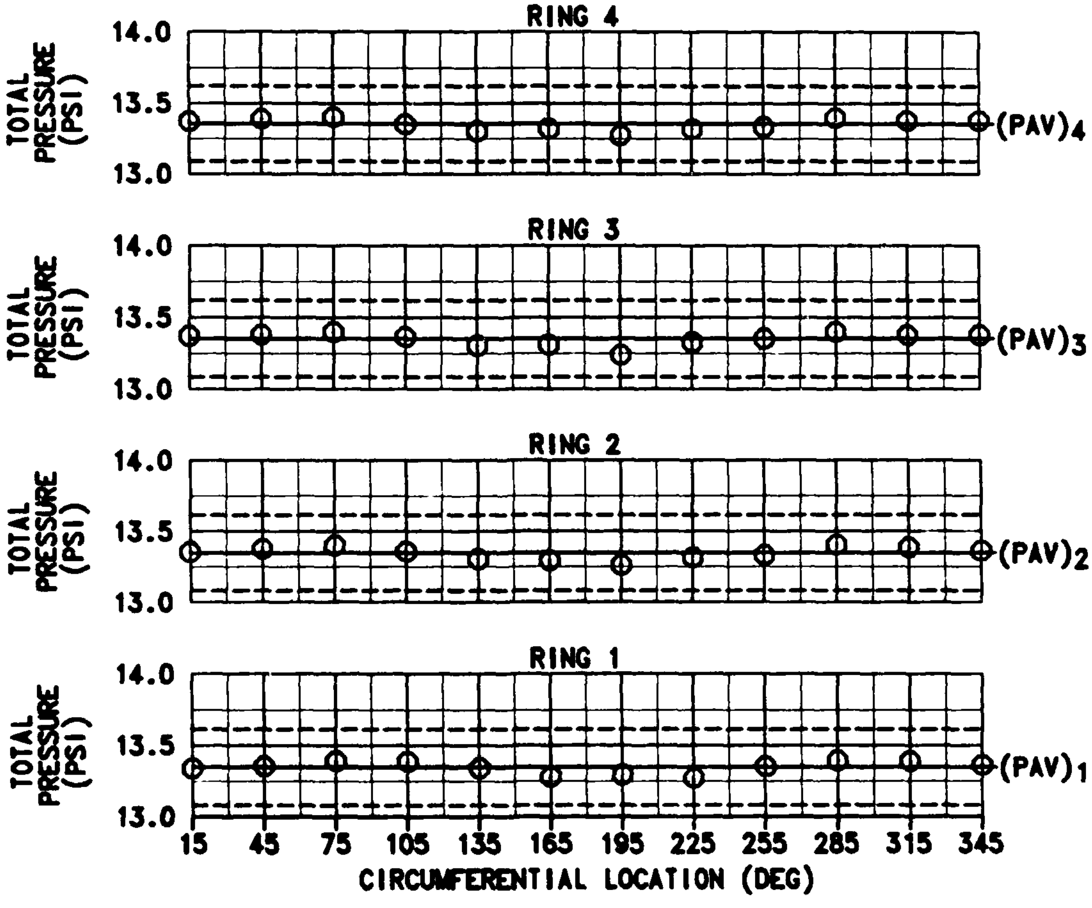


FIGURE E-74

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET

LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8800	137.3	0.0	2220	9.0	322	18	30.5

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.

3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

4. WINDS LESS THAN THREE KNOTS.

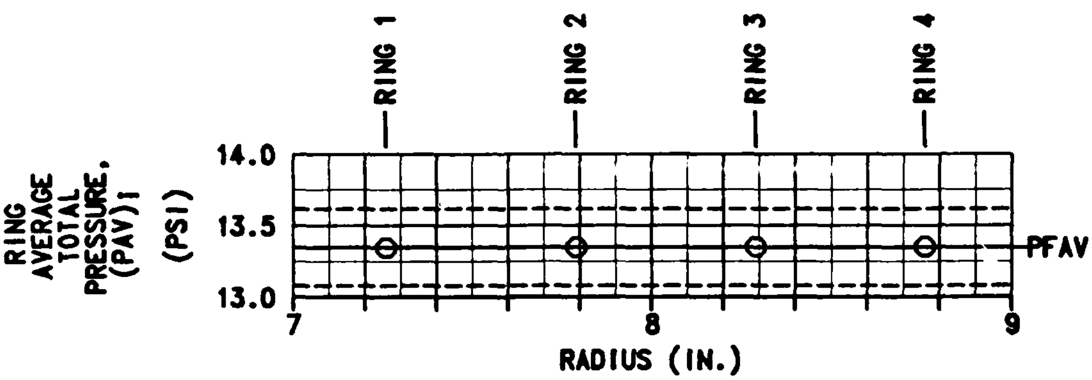


FIGURE E-75

CIRCUMFERENTIAL TEMPERATURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 180-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8800	137.3	0.0	2220	9.0	322	18	30.5

NOTES: 1. WINDS LESS THAN THREE KNOTS.
2. RELATIVE AND ABSOLUTE ERRORS IN INLET TEMPERATURE MEASUREMENTS ARE DESCRIBED IN APPENDIX C, PARAGRAPH 6 AND TABLE C-1.

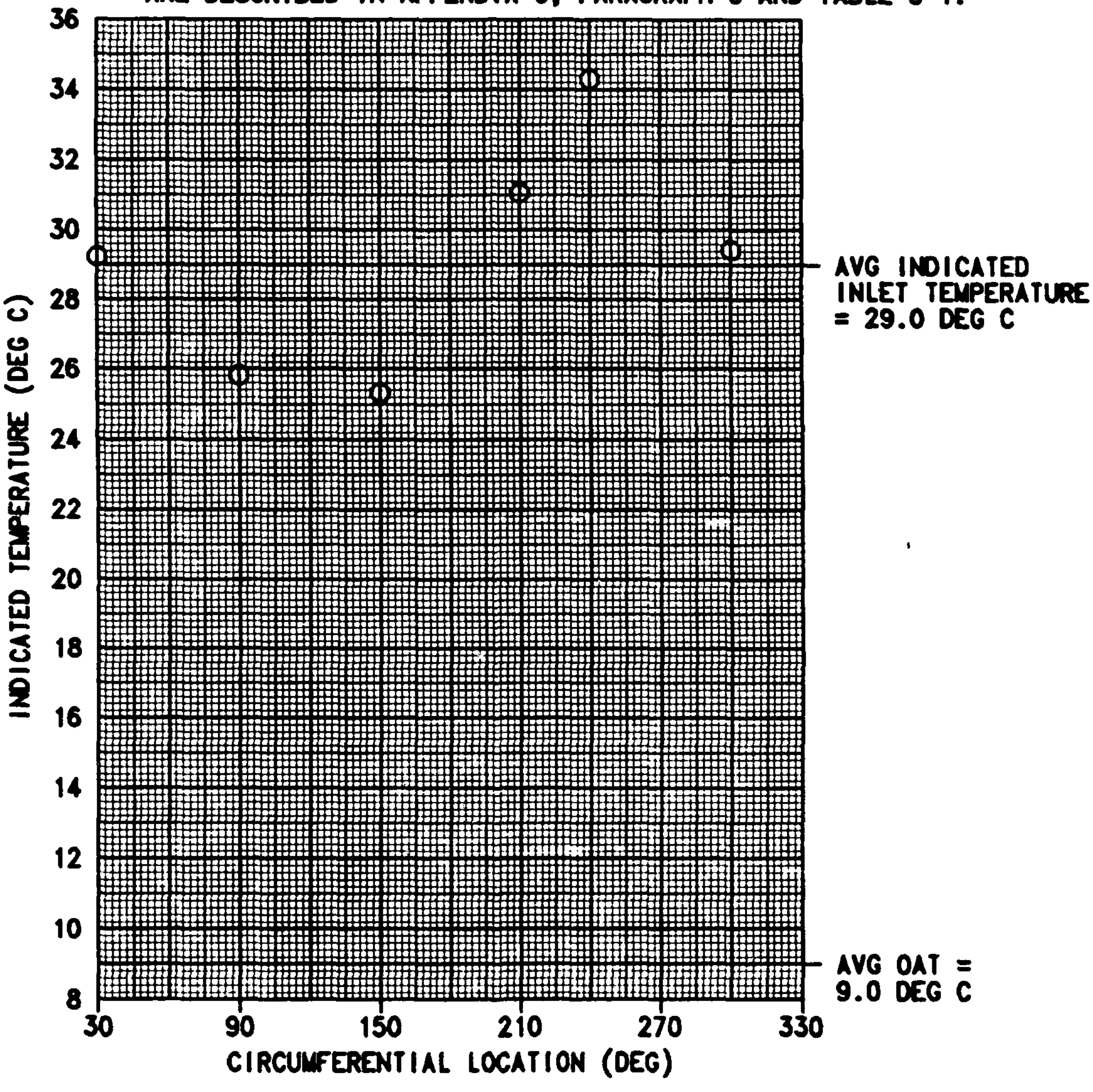


FIGURE E-76

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 270-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8910	137.7	0.0	2220	18.0	323	15	31.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
3. WINDS LESS THAN THREE KNOTS.

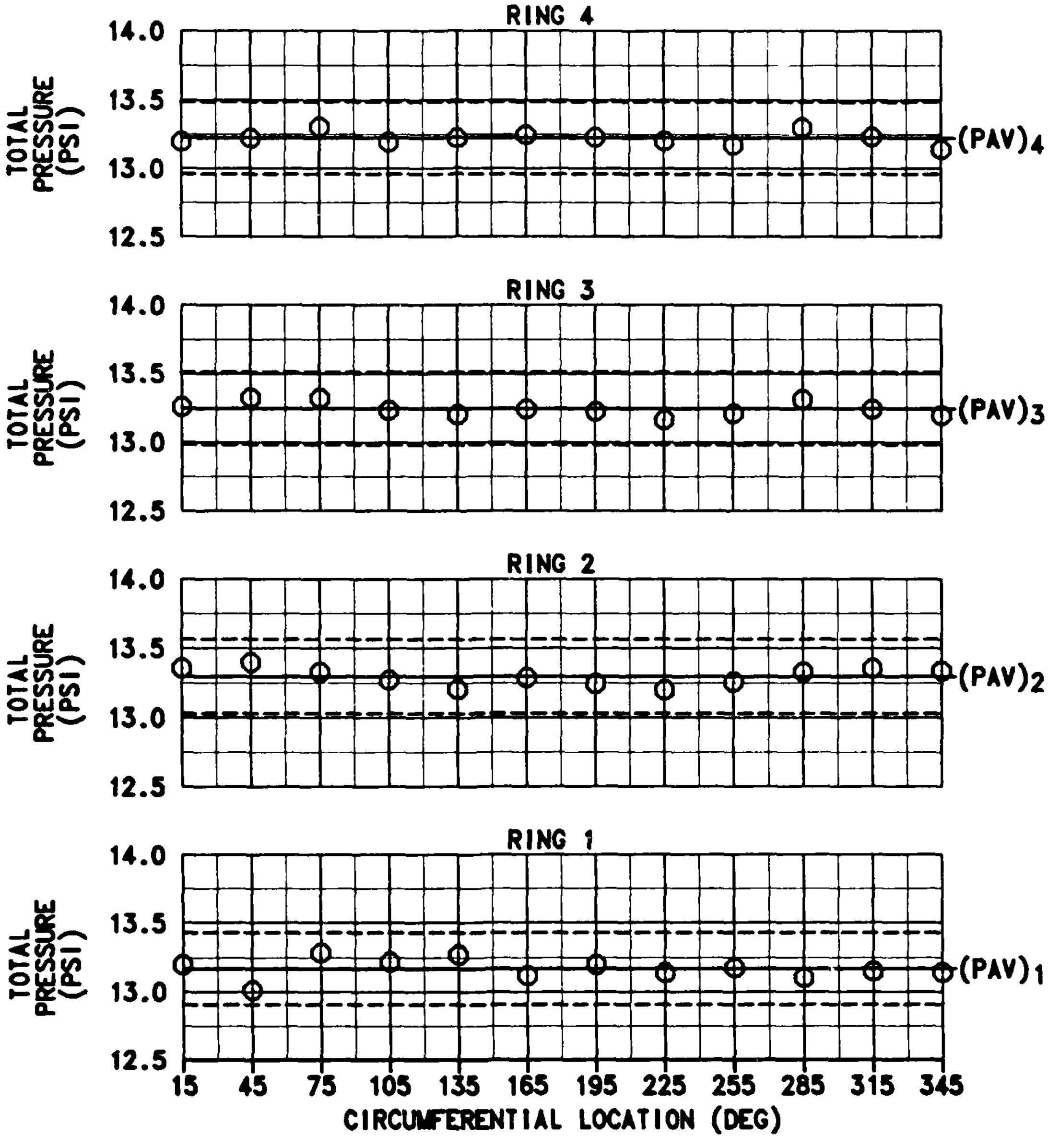


FIGURE E-77

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 270-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
STANDARD FILTER INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	AVG CG LOCATION LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8910	137.7	0.0	2220	18.0	323	15	31.0

NOTES:

1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE;
   $PFAV = [(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

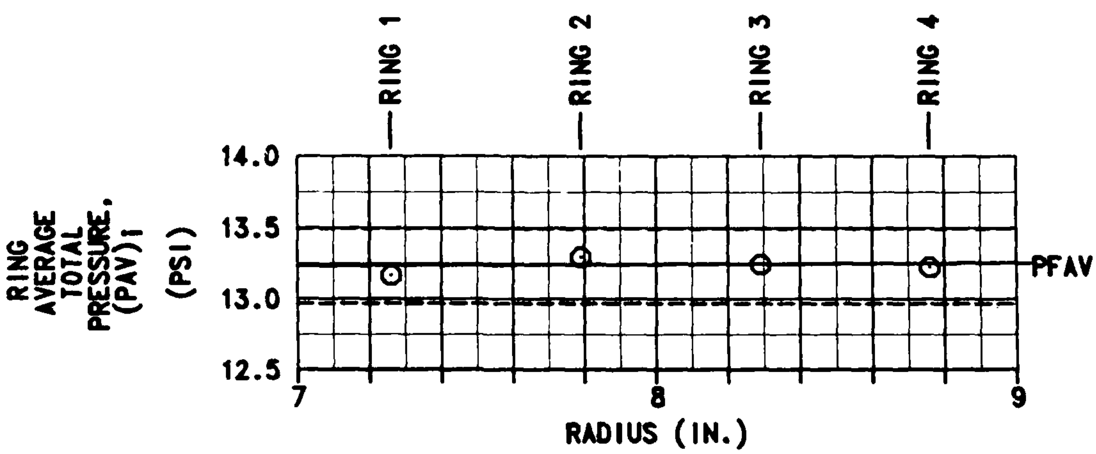


FIGURE E-78

CIRCUMFERENTIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 270-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG PRESSURE ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)	TRUE AIRSPEED (KTS)
8920	137.7	0.0	2220	8.5	322	13	30.0

NOTES: 1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.

2. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.

3. WINDS LESS THAN THREE KNOTS.

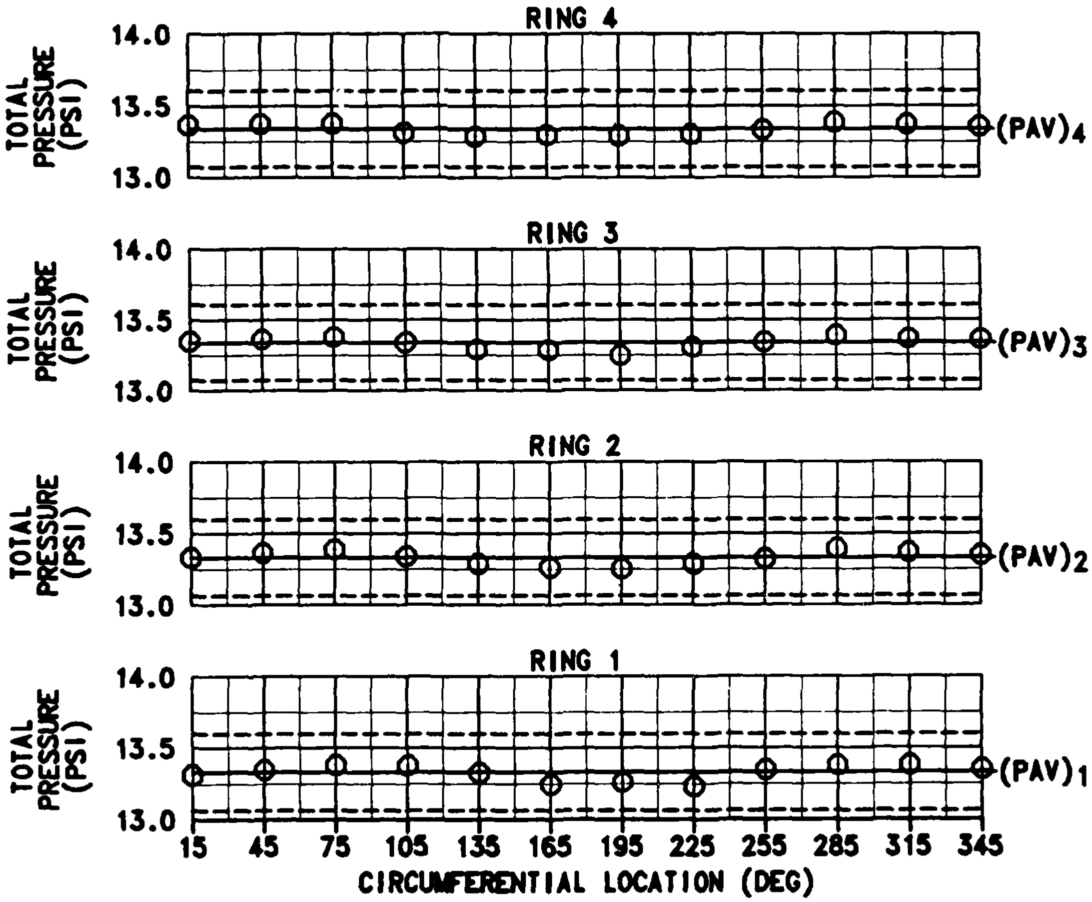


FIGURE E-79

RADIAL PRESSURE DISTRIBUTION IN ENGINE INLET
LOW-SPEED FLIGHT AT 270-DEGREE AZIMUTH

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B
IEAFS INSTALLED

AVG GROSS WEIGHT	AVG CG LOCATION LONG	AVG CG LOCATION LAT	AVG PRESSURE ALTITUDE	AVG OAT	AVG ROTOR SPEED	AVG SKID HEIGHT	TRUE AIRSPEED
(LB)	(FS)	(BL)	(FT)	(DEG C)	(RPM)	(FT)	(KTS)
8920	137.7	0.0	2220	8.5	322	13	30.0

NOTES:
1. PAV IS AVERAGE TOTAL PRESSURE FOR EACH RING.
2. PFAV IS FACE AVERAGE TOTAL PRESSURE; PFAV = $[(PAV)_1 + (PAV)_2 + (PAV)_3 + (PAV)_4]/4$.
3. DASHED LINES DENOTE PLUS OR MINUS 2-PERCENT PRESSURE VARIATION ALLOWED BY ENGINE MODEL SPECIFICATION.
4. WINDS LESS THAN THREE KNOTS.

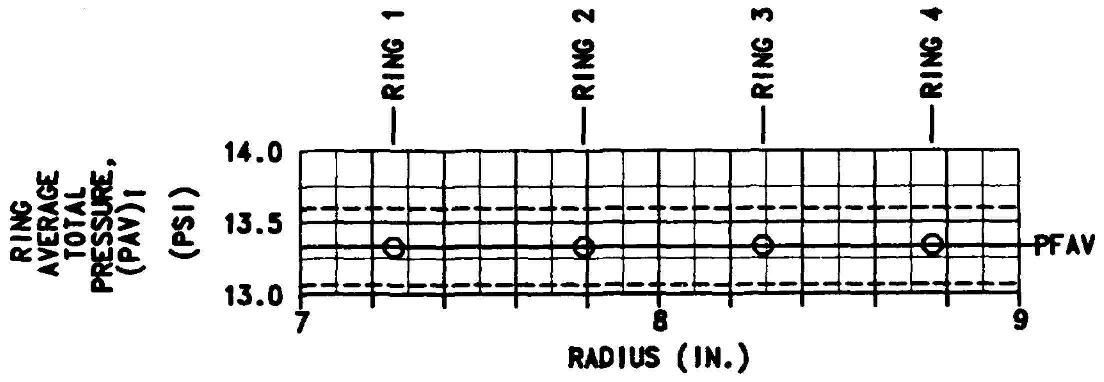


FIGURE E-80

ENGINE CHARACTERISTICS IN HOVER

JUH-1H USA S/N 69-15532

T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
○	8770	137.2	0.0	3430	21.0	322	3
□	8760	137.2	0.0	3430	21.0	322	5
◇	8750	137.2	0.0	3430	21.0	322	8
△	8620	136.8	0.0	3320	20.0	322	10
○/	8720	137.1	0.0	3320	20.0	322	13
□/	8710	137.1	0.0	3320	20.0	322	16
◇/	8700	137.0	0.0	3320	20.0	322	19
△/	8680	137.0	0.0	3320	20.0	321	25
/○	8670	136.9	0.0	3320	20.0	322	30
/□	8660	136.9	0.0	3320	20.0	321	40
/◇	8640	136.8	0.0	3320	20.0	321	51
●	8780	137.3	0.0	2050	9.0	321	2
■	8770	137.2	0.0	2070	9.5	321	5
◆	8760	137.2	0.0	2070	9.5	321	8
▲	8750	137.2	0.0	2050	10.0	321	10
●/	8740	137.1	0.0	2050	10.0	321	12
■/	8730	137.1	0.0	2070	9.5	321	15
◆/	8720	137.1	0.0	2110	9.5	321	20
▲/	8710	137.0	0.0	2150	10.0	320	25
/●	8700	137.0	0.0	2150	10.0	320	32
/■	8770	137.0	0.0	2150	10.0	320	41
/◆	8770	137.0	0.0	2150	10.0	320	51

NOTES:
1. OPEN SYMBOLS DENOTE STANDARD FILTER INSTALLED.
2. SHADED SYMBOLS DENOTE IEAFS INSTALLED.
3. WINDS LESS THAN THREE KNOTS.

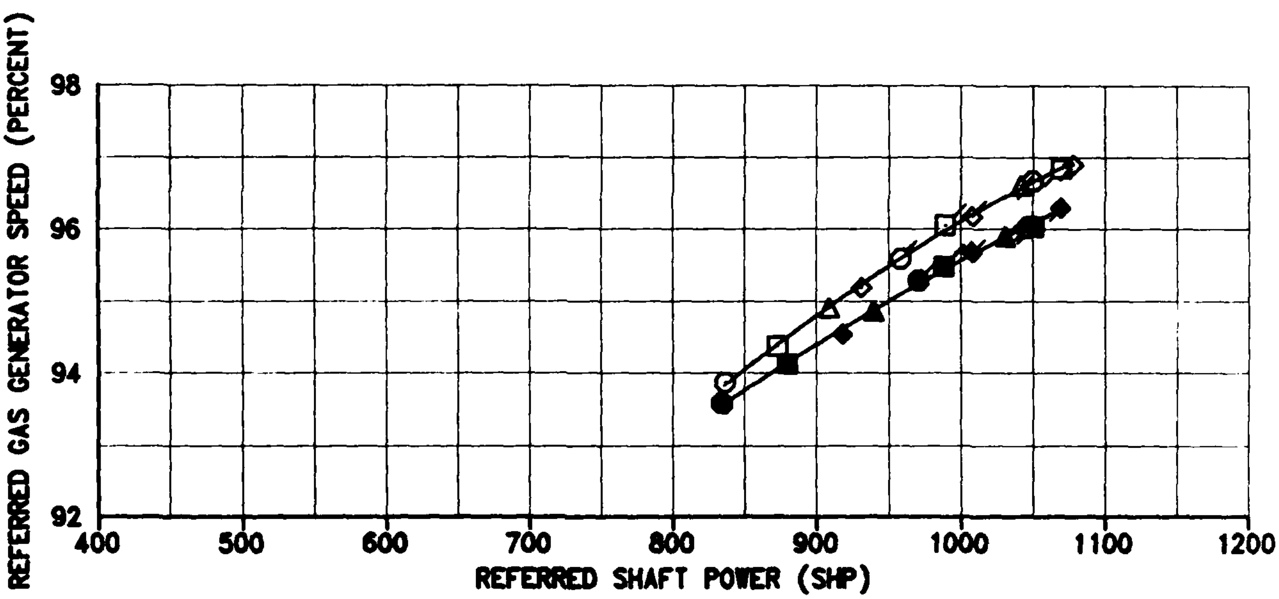


FIGURE E-81
ENGINE CHARACTERISTICS IN HOVER
JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
⊙	8770	137.2	0.0	3430	21.0	322	3
⊡	8760	137.2	0.0	3430	21.0	322	5
◇	8750	137.2	0.0	3430	21.0	322	8
△	8620	136.8	0.0	3320	20.0	322	10
⊙/	8720	137.1	0.0	3320	20.0	322	13
⊡/	8710	137.1	0.0	3320	20.0	322	16
◇/	8700	137.0	0.0	3320	20.0	322	19
△/	8680	137.0	0.0	3320	20.0	321	25
/⊙	8670	136.9	0.0	3320	20.0	322	30
/⊡	8660	136.9	0.0	3320	20.0	321	40
/◇	8640	136.8	0.0	3320	20.0	321	51
●	8780	137.3	0.0	2050	9.0	321	2
■	8770	137.2	0.0	2070	9.5	321	5
◆	8760	137.2	0.0	2070	9.5	321	8
▲	8750	137.2	0.0	2050	10.0	321	10
●/	8740	137.1	0.0	2050	10.0	321	12
■/	8730	137.1	0.0	2070	9.5	321	15
◆/	8720	137.1	0.0	2110	9.5	321	20
▲/	8710	137.0	0.0	2150	10.0	320	25
/●	8700	137.0	0.0	2150	10.0	320	32
/■	8770	137.0	0.0	2150	10.0	320	41
/◆	8770	137.0	0.0	2150	10.0	320	51

NOTES:
1. OPEN SYMBOLS DENOTE STANDARD FILTER INSTALLED.
2. SHADED SYMBOLS DENOTE IEAFS INSTALLED.
3. WINDS LESS THAN THREE KNOTS.

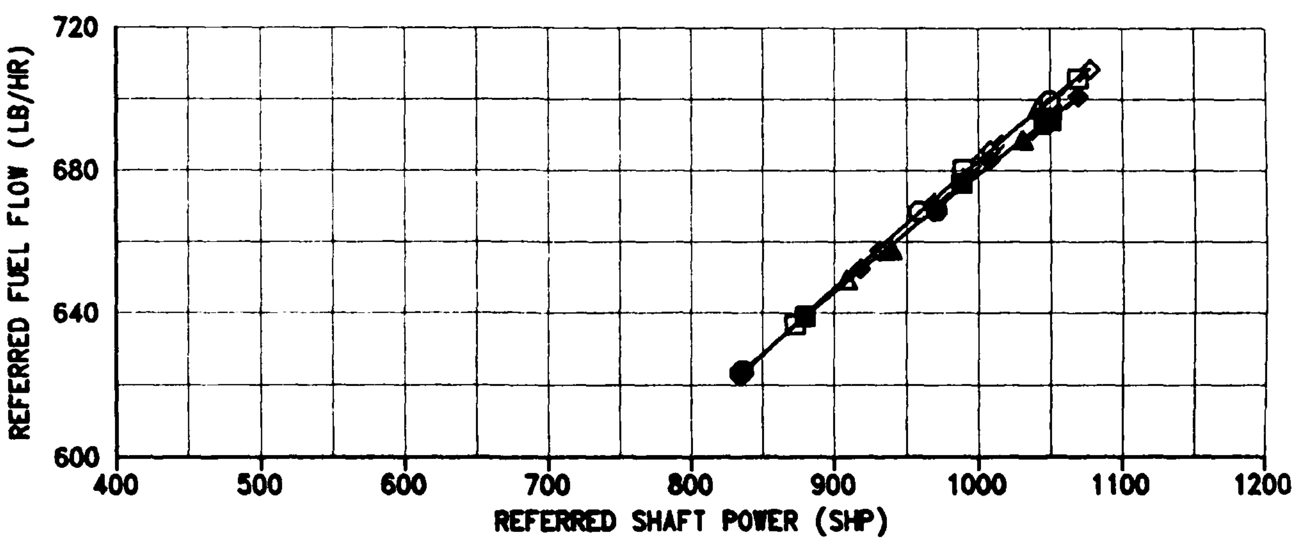


FIGURE E-82

ENGINE CHARACTERISTICS IN BALL-CENTERED LEVEL FLIGHT

JUH-1H USA S/N 69-15532

T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG REFERRED OUTPUT SHAFT SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)	FILTER
⊙	8110	137.6	0.1LT	6790	9.0	324.5	6615	58 TO 100	STD
⊡	8110	136.4	0.0	6760	9.0	325.0	6624	49 TO 103	IEAFS
◇	---	---	---	-710	11.5	---	6631	---	NONE (TEST CELL)

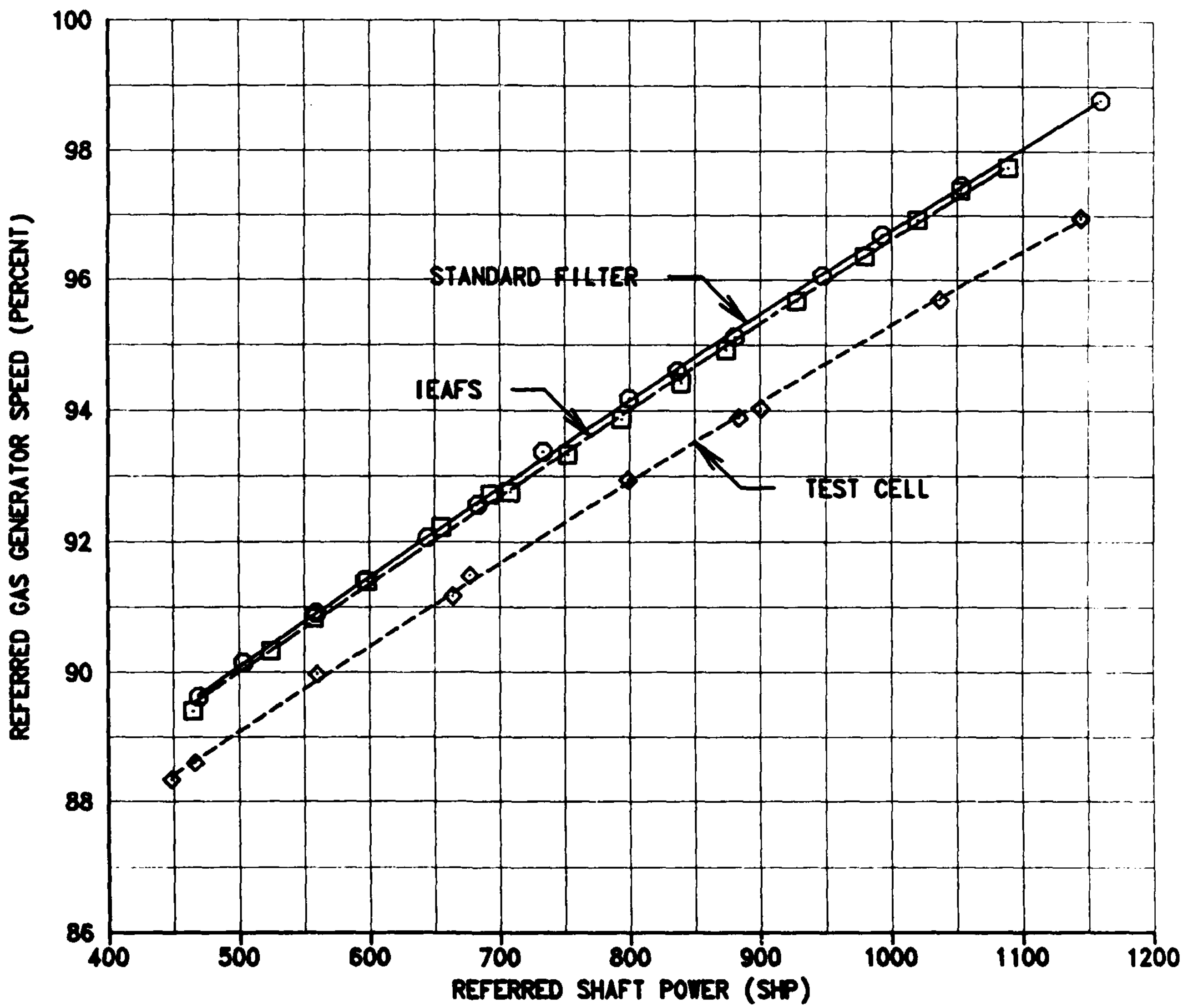


FIGURE E-83

ENGINE CHARACTERISTICS IN BALL-CENTERED LEVEL FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG REFERRED OUTPUT SHAFT SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)	FILTER
⊙	8110	137.6	0.1LT	6790	9.0	324.5	6615	58 TO 100	STD
⊡	8110	136.4	0.0	6760	9.0	325.0	6624	49 TO 103	IEAFS
◇	---	---	---	-710	11.5	---	6631	---	NONE (TEST CELL)

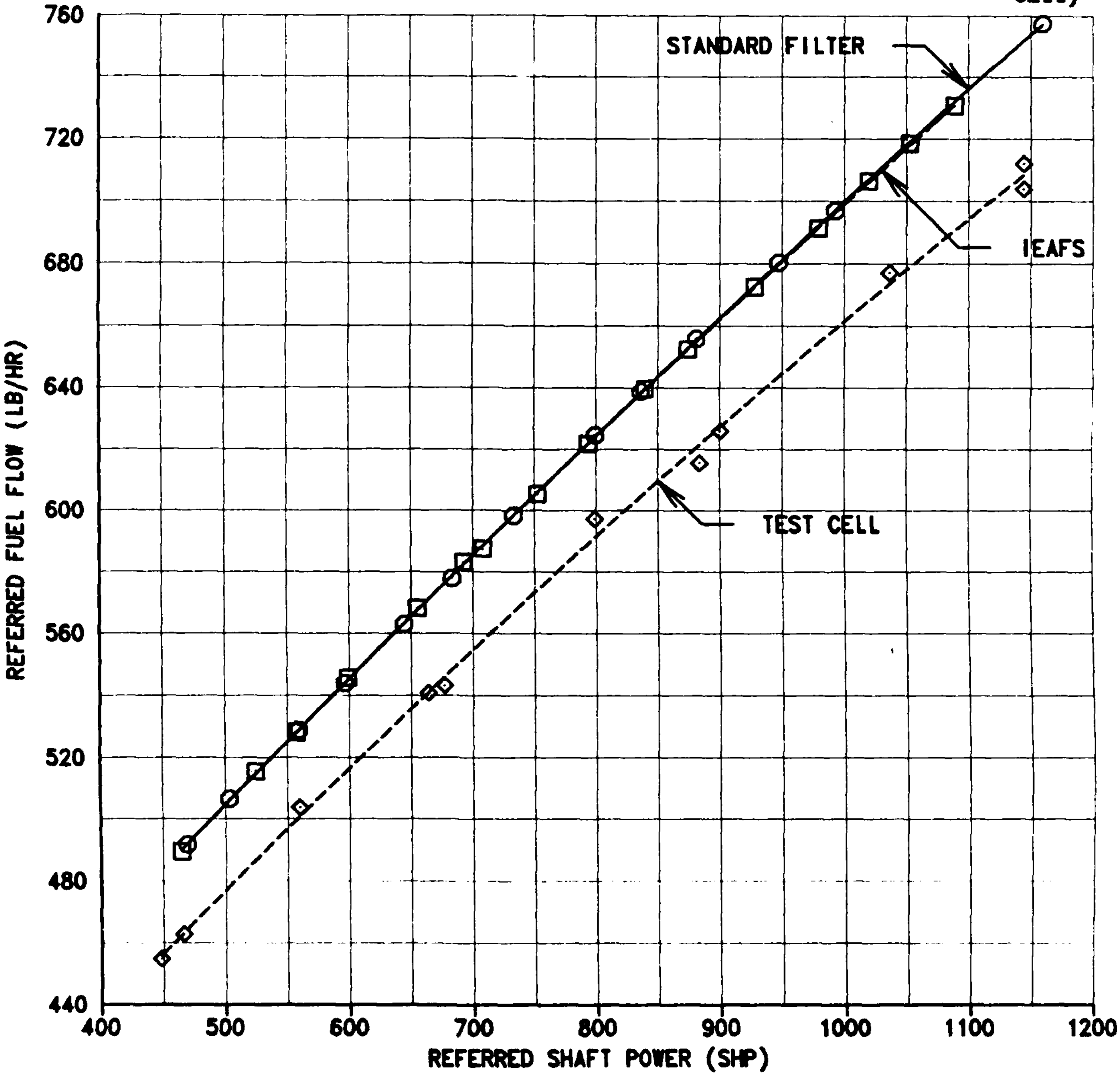


FIGURE E-84

ENGINE CHARACTERISTICS IN BALL-CENTERED LEVEL FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG REFERRED OUTPUT SHAFT SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)	FILTER
⊙	7740	136.7	0.1LT	6570	7.5	313.8	6395	67 TO 102	STD
⊡	7730	135.4	0.0	6790	9.5	314.2	6405	39 TO 108	IEAFS
◇	---	---	---	-460	13.0	---	6430	---	NONE (TEST CELL)

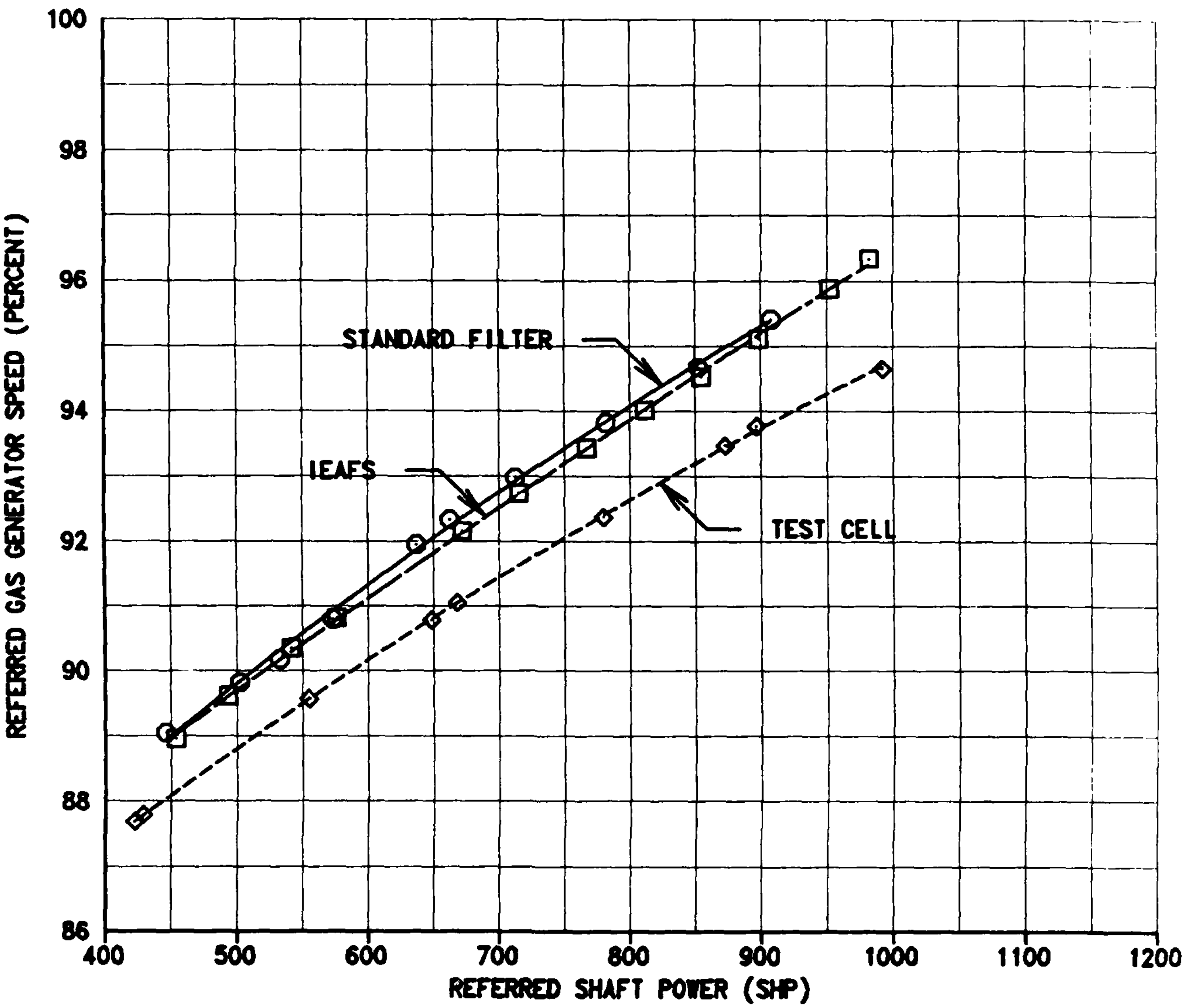


FIGURE E-85

ENGINE CHARACTERISTICS IN BALL-CENTERED LEVEL FLIGHT

JUH-1H USA S/N 69-15532
T53-L-13B S/N LE16820B

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG REFERRED ROTOR SPEED (RPM)	AVG REFERRED OUTPUT SHAFT SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)	FILTER
○	7740	136.7	0.1LT	6570	7.5	313.8	6395	67 TO 102	STD
□	7730	135.4	0.0	6790	9.5	314.2	6405	39 TO 108	IEAFS
◇	---	---	---	-460	13.0	---	6430	---	NONE (TEST CELL)

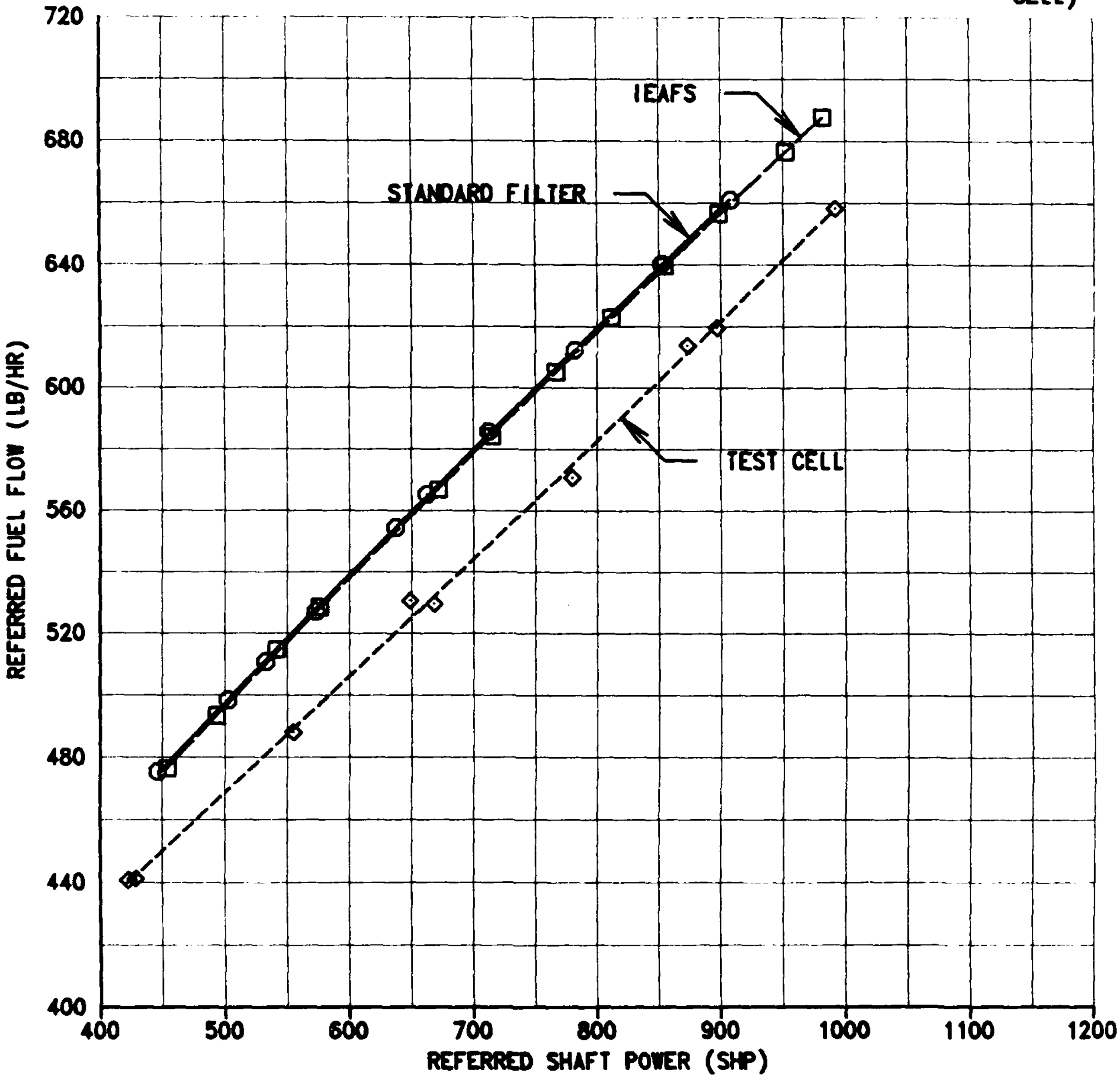


FIGURE E-86

STATIC LATERAL-DIRECTIONAL STABILITY

JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)
8780	137.0	0.1 LT	6200	-1.0	322	92

NOTE: SHADED SYMBOLS DENOTE TRIM POINT.

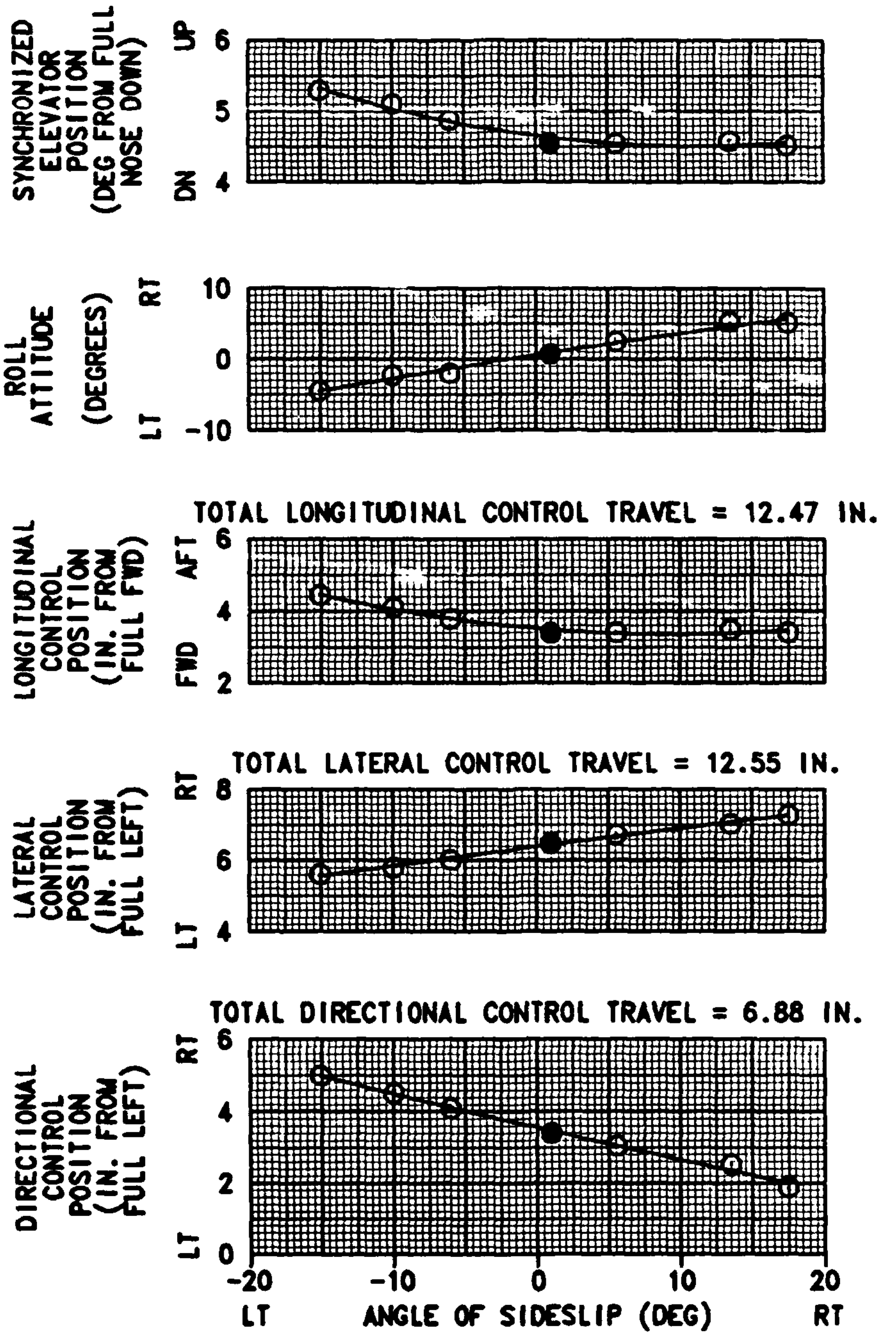


FIGURE E-87

MANEUVERING STABILITY
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	TRIM FLIGHT CONDITION
○	9040	137.9	0.1 LT	5950	-0.5	323	94	RIGHT TURN
□	8960	137.6	0.1 LT	5970	-1.0	323	94	LEFT TURN

NOTE: SHADED SYMBOLS DENOTE TRIM POINT.

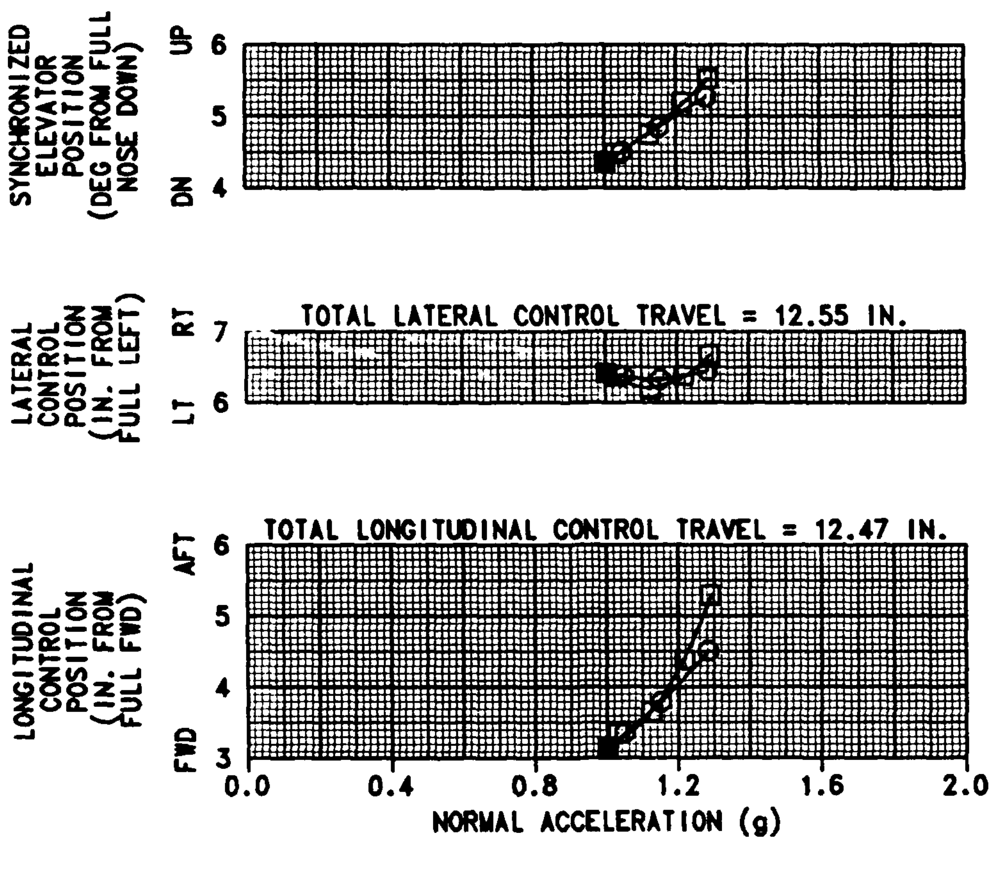


FIGURE E-88

LOW-AIRSPEED 0-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8580	137.1	0.1LT	320	-1.0	324	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

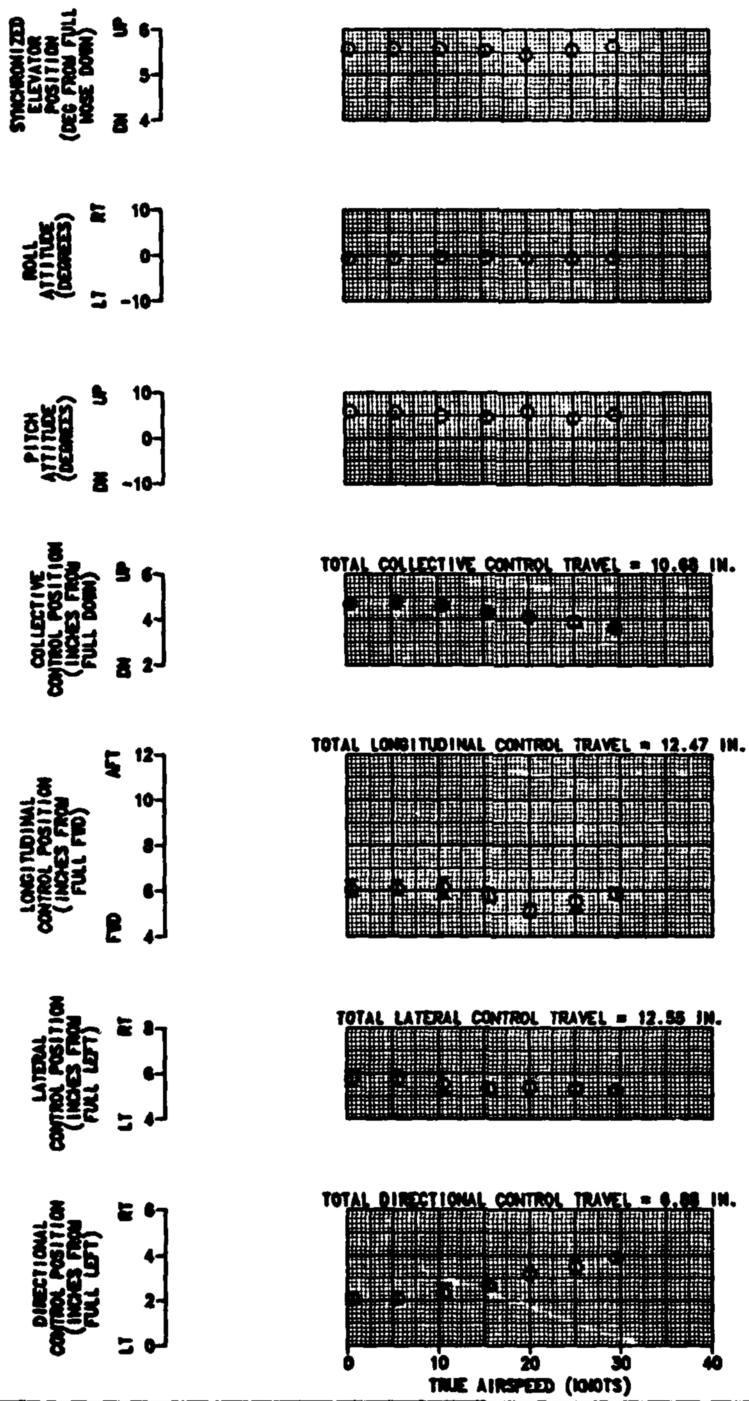


FIGURE E-89

LOW-AIRSPEED 30-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8610	136.8	0.0	980	0.5	319	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

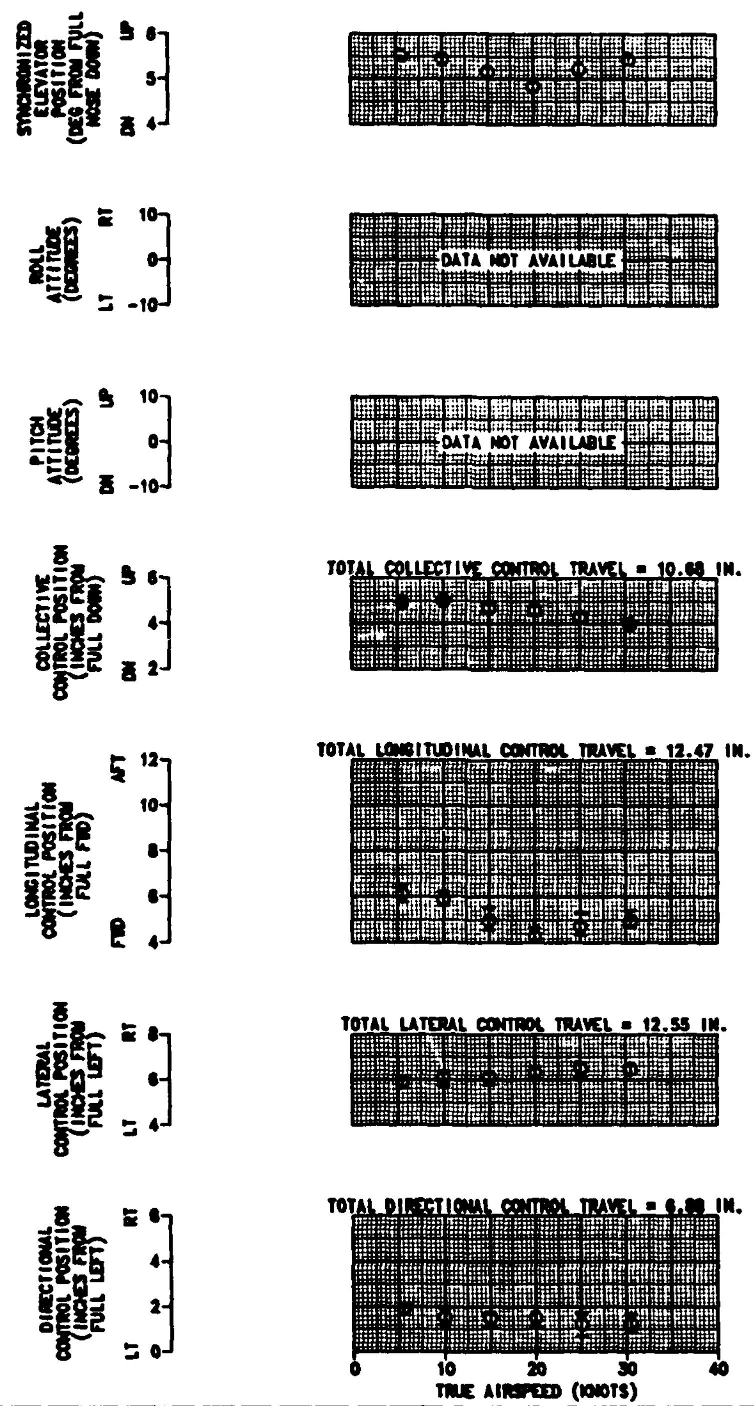


FIGURE E-90

LOW-AIRSPEED 60-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8690	136.1	0.0	1160	2.0	322	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

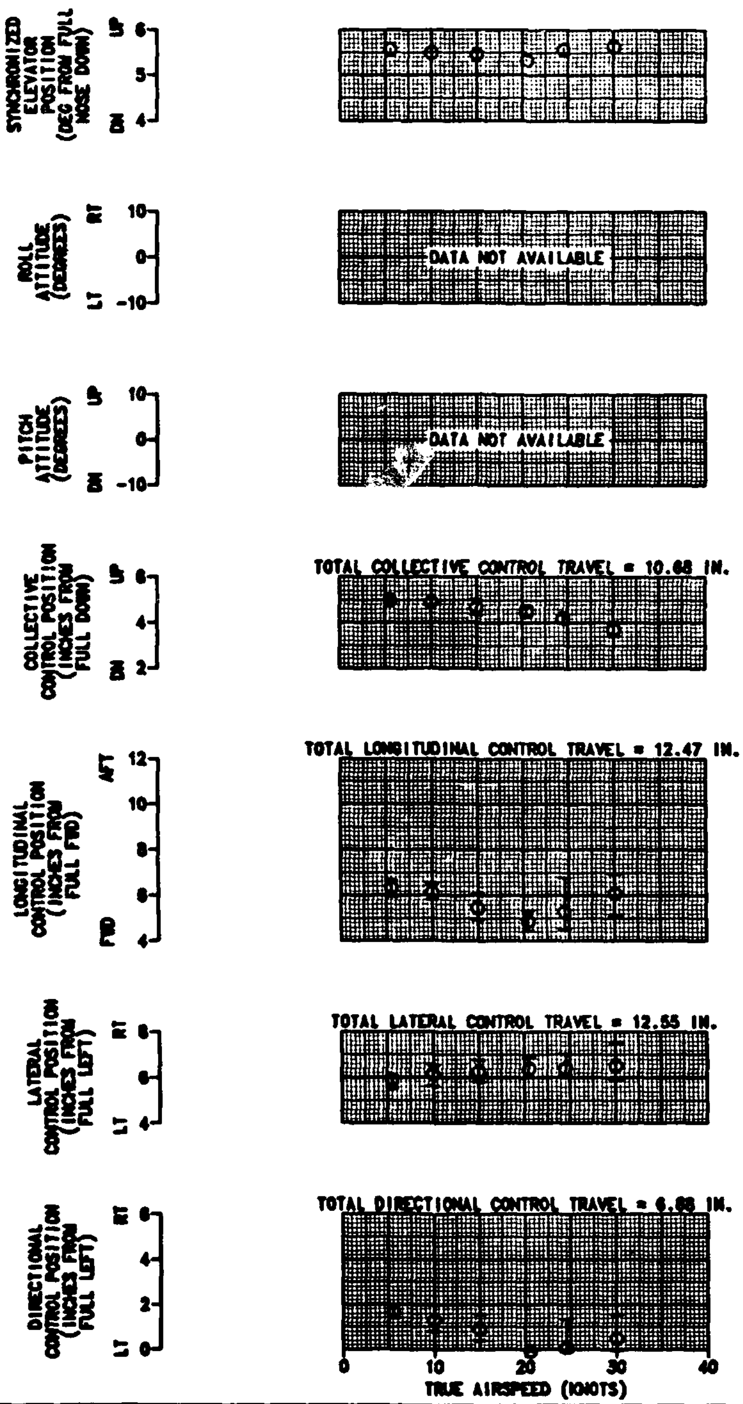


FIGURE E-91

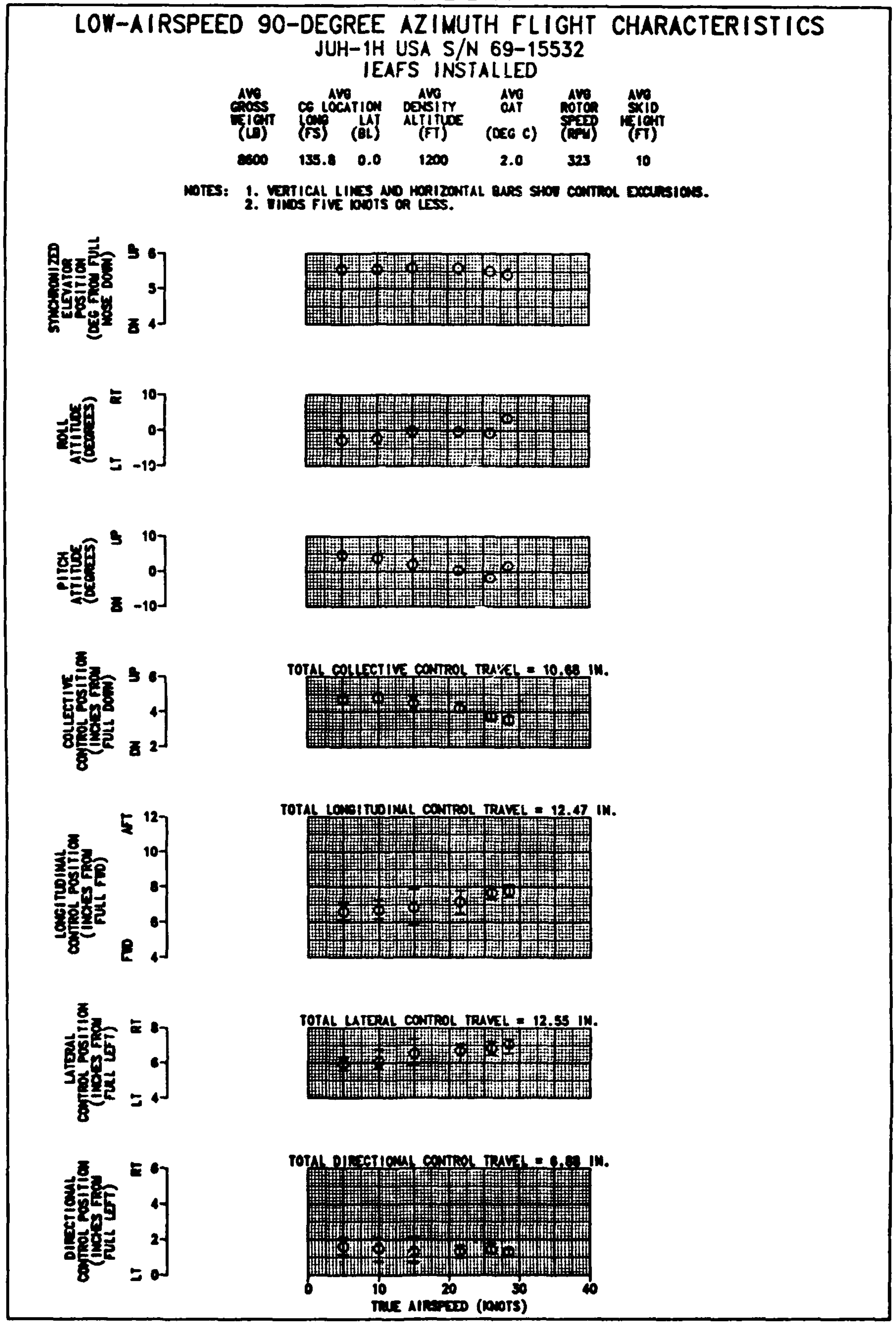

LOW-AIRSPEED 90-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED
AVG GROSS WEIGHT (LB) 8600
AVG CG LOCATION LONG (FS) 135.8 LAT (BL) 0.0
AVG DENSITY ALTITUDE (FT) 1200
AVG OAT (DEG C) 2.0
AVG ROTOR SPEED (RPM) 323
AVG SKID HEIGHT (FT) 10
NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.
SYNCHRONIZED ELEVATOR POSITION (DEG FROM FULL NOSE DOWN)
UP
DN
ROLL ATTITUDE (DEGREES)
RT
LT
PITCH ATTITUDE (DEGREES)
COLLECTIVE CONTROL POSITION (INCHES FROM FULL DOWN)
TOTAL COLLECTIVE CONTROL TRAVEL = 10.68 IN.
LONGITUDINAL CONTROL POSITION (INCHES FROM FULL FWD)
AFT
FWD
TOTAL LONGITUDINAL CONTROL TRAVEL = 12.47 IN.
LATERAL CONTROL POSITION (INCHES FROM FULL LEFT)
TOTAL LATERAL CONTROL TRAVEL = 12.55 IN.
DIRECTIONAL CONTROL POSITION (INCHES FROM FULL LEFT)
TOTAL DIRECTIONAL CONTROL TRAVEL = 6.88 IN.
TRUE AIRSPEED (KNOTS)

FIGURE E-92

LOW-AIRSPEED 120-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8640	135.4	0.0	1260	2.5	323	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

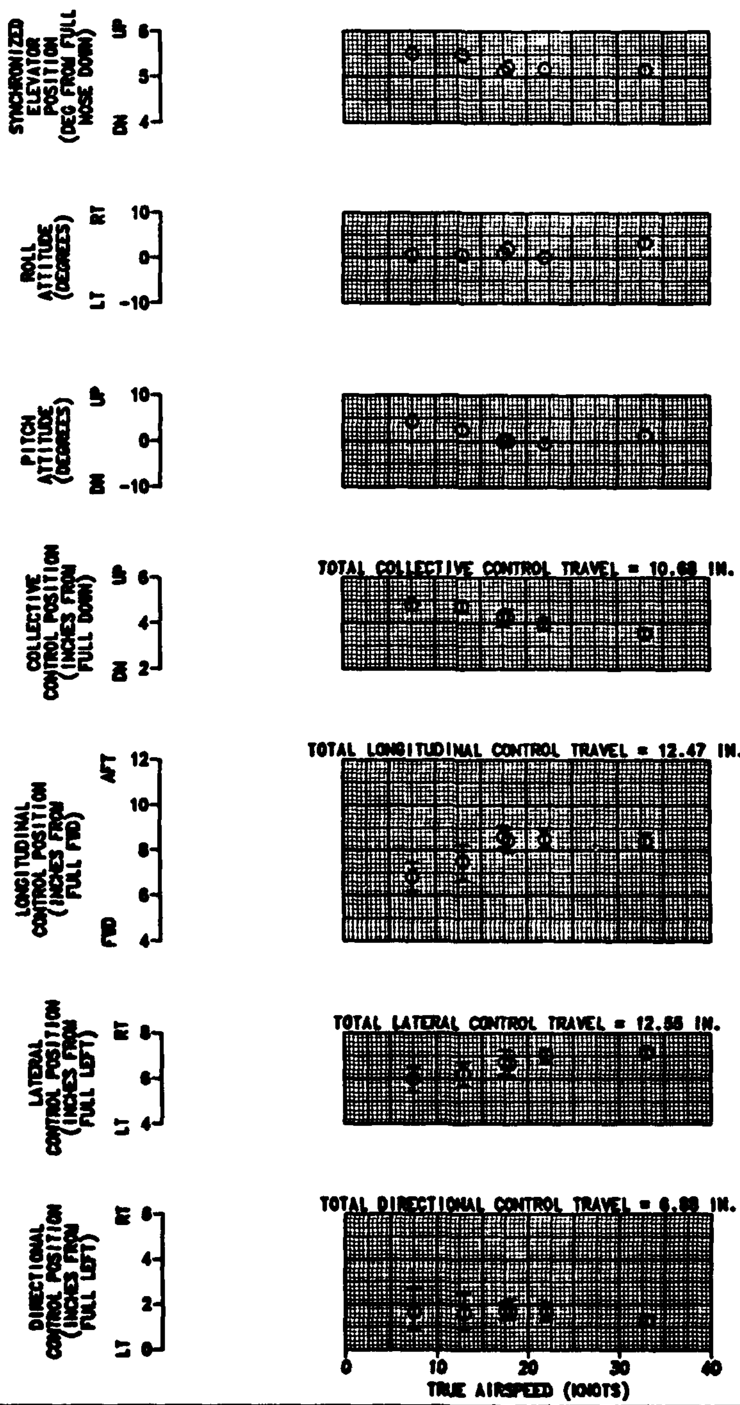


FIGURE E-93

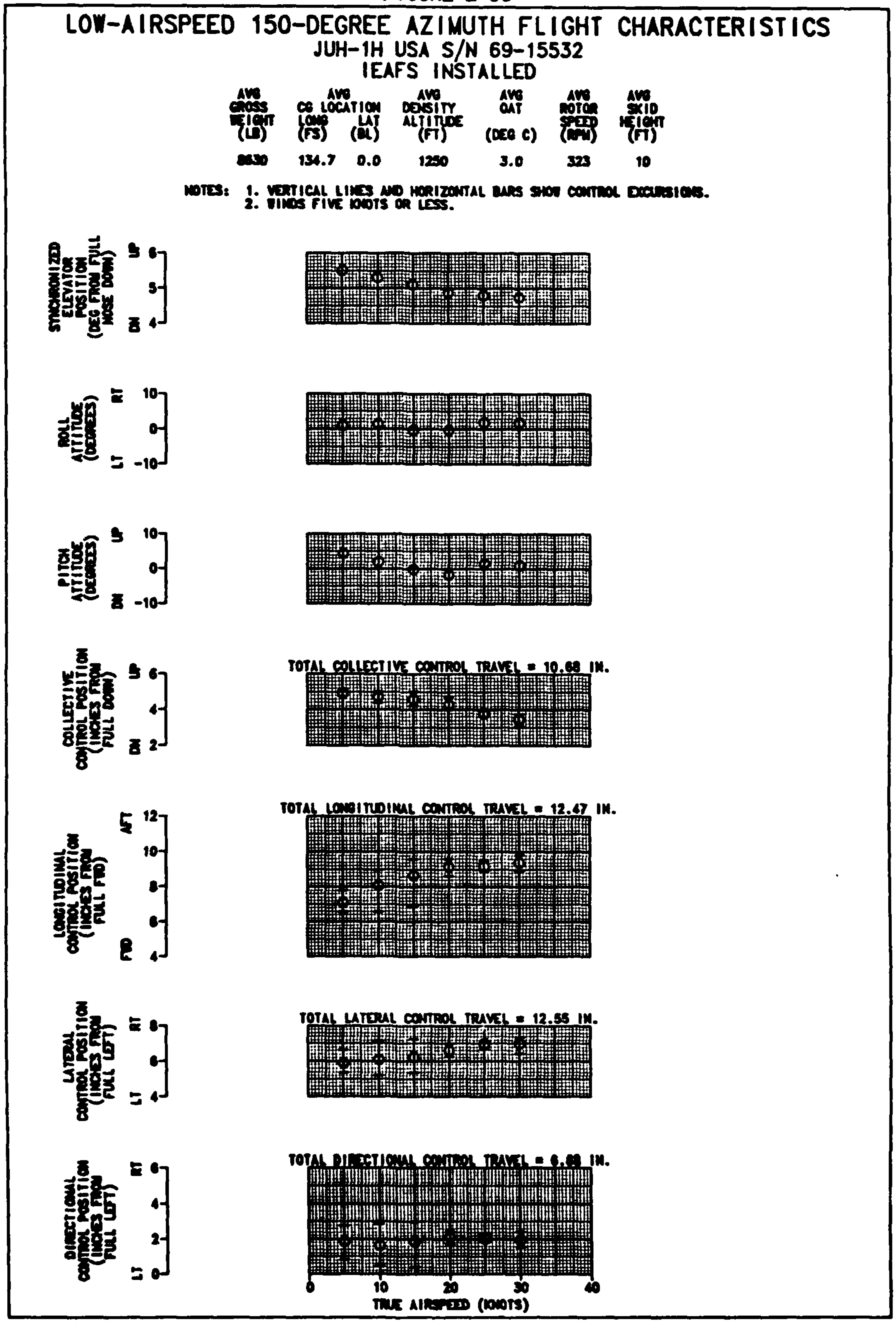

LOW-AIRSPEED 150-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED
AVG GROSS WEIGHT (LB) 8630
AVG CG LOCATION LONG (FS) 134.7 LAT (BL) 0.0
AVG DENSITY ALTITUDE (FT) 1250
AVG OAT (DEG C) 3.0
AVG ROTOR SPEED (RPM) 323
AVG SKID HEIGHT (FT) 10
NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.
SYNCHRONIZED ELEVATOR POSITION (DEG FROM FULL NOSE DOWN)
UP
DN
ROLL ATTITUDE (DEGREES)
RT
LT
PITCH ATTITUDE (DEGREES)
TOTAL COLLECTIVE CONTROL TRAVEL = 10.68 IN.
COLLECTIVE CONTROL POSITION (INCHES FROM FULL DOWN)
TOTAL LONGITUDINAL CONTROL TRAVEL = 12.47 IN.
LONGITUDINAL CONTROL POSITION (INCHES FROM FULL FWD)
AFT
FWD
TOTAL LATERAL CONTROL TRAVEL = 12.55 IN.
LATERAL CONTROL POSITION (INCHES FROM FULL LEFT)
TOTAL DIRECTIONAL CONTROL TRAVEL = 6.88 IN.
DIRECTIONAL CONTROL POSITION (INCHES FROM FULL LEFT)
TRUE AIRSPEED (KNOTS)

FIGURE E-94

LOW-AIRSPEED 180-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8660	134.5	0.0	1510	5.0	323	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

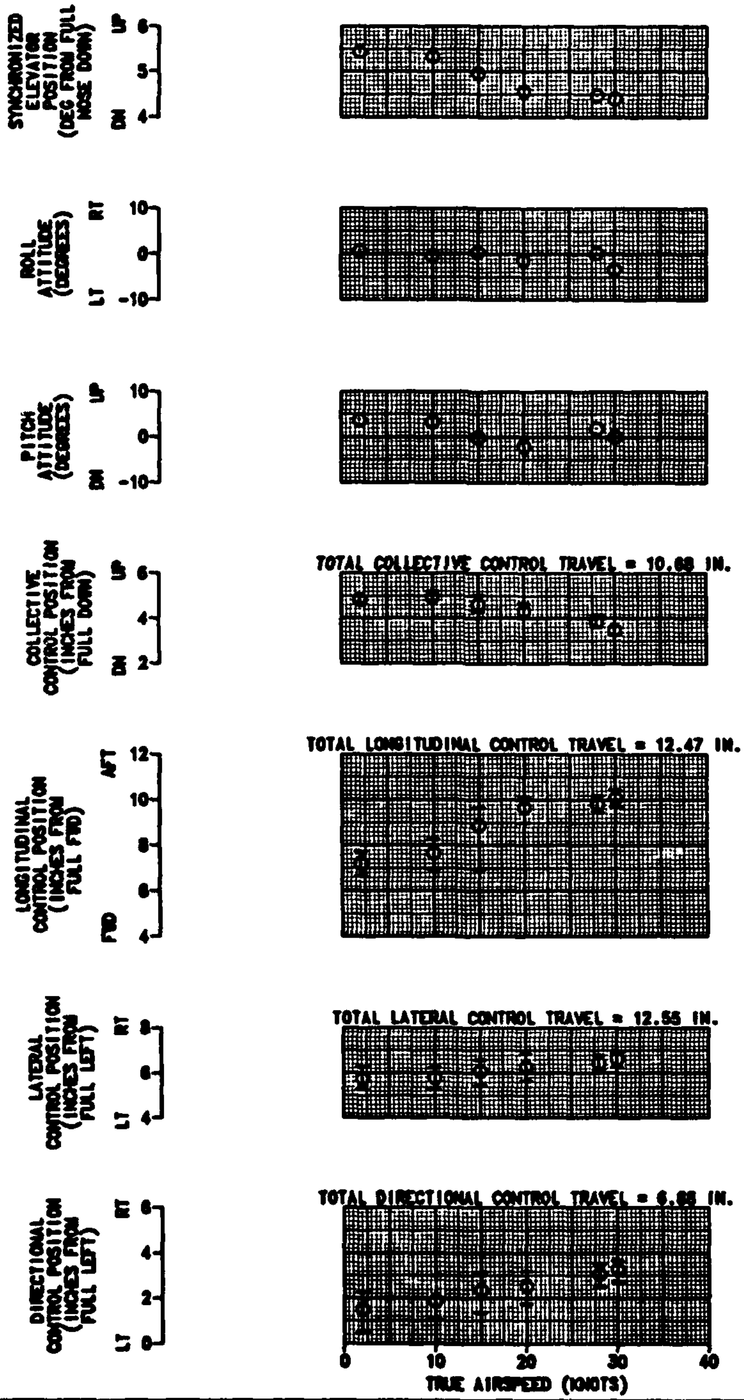


FIGURE E-95

LOW-AIRSPEED 210-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8650	137.1	0.0	1950	8.5	324	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

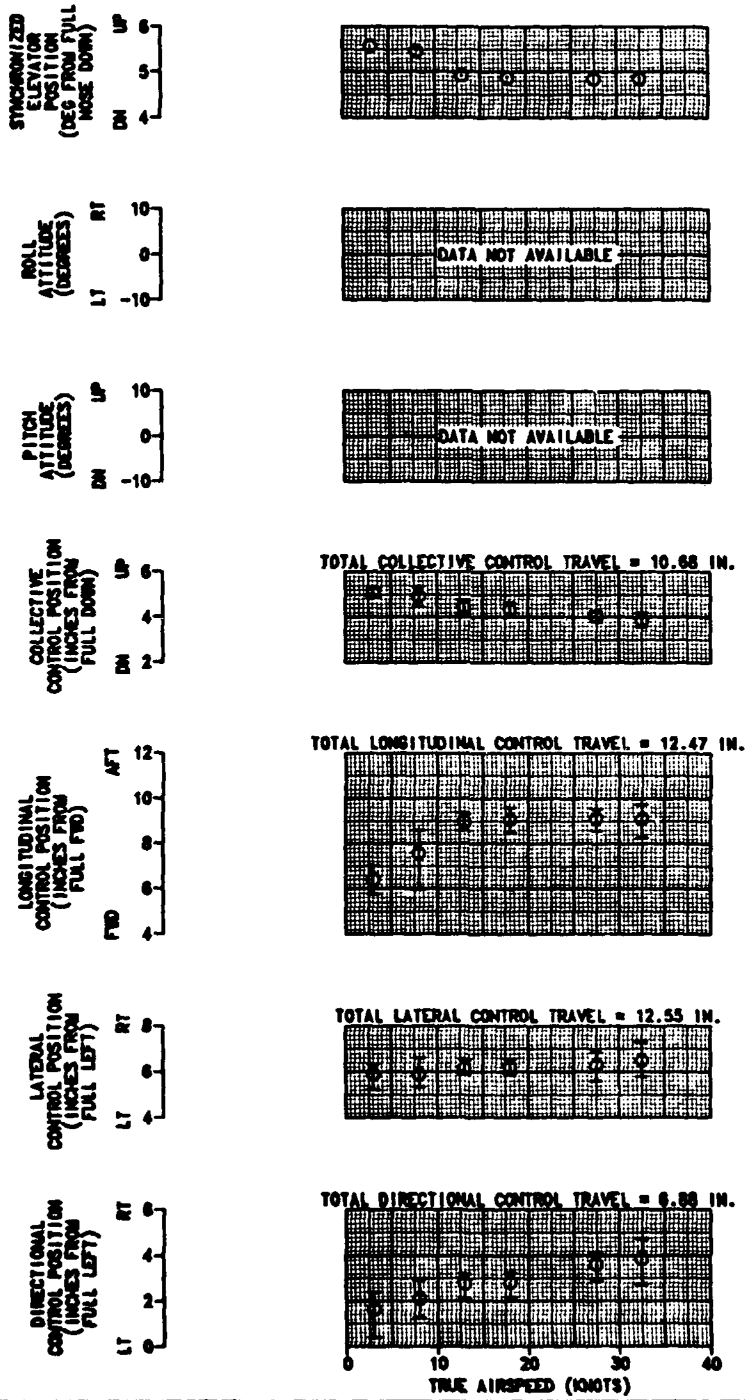


FIGURE E-96

LOW-AIRSPEED 240-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8080	136.7	0.0	2030	9.0	324	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

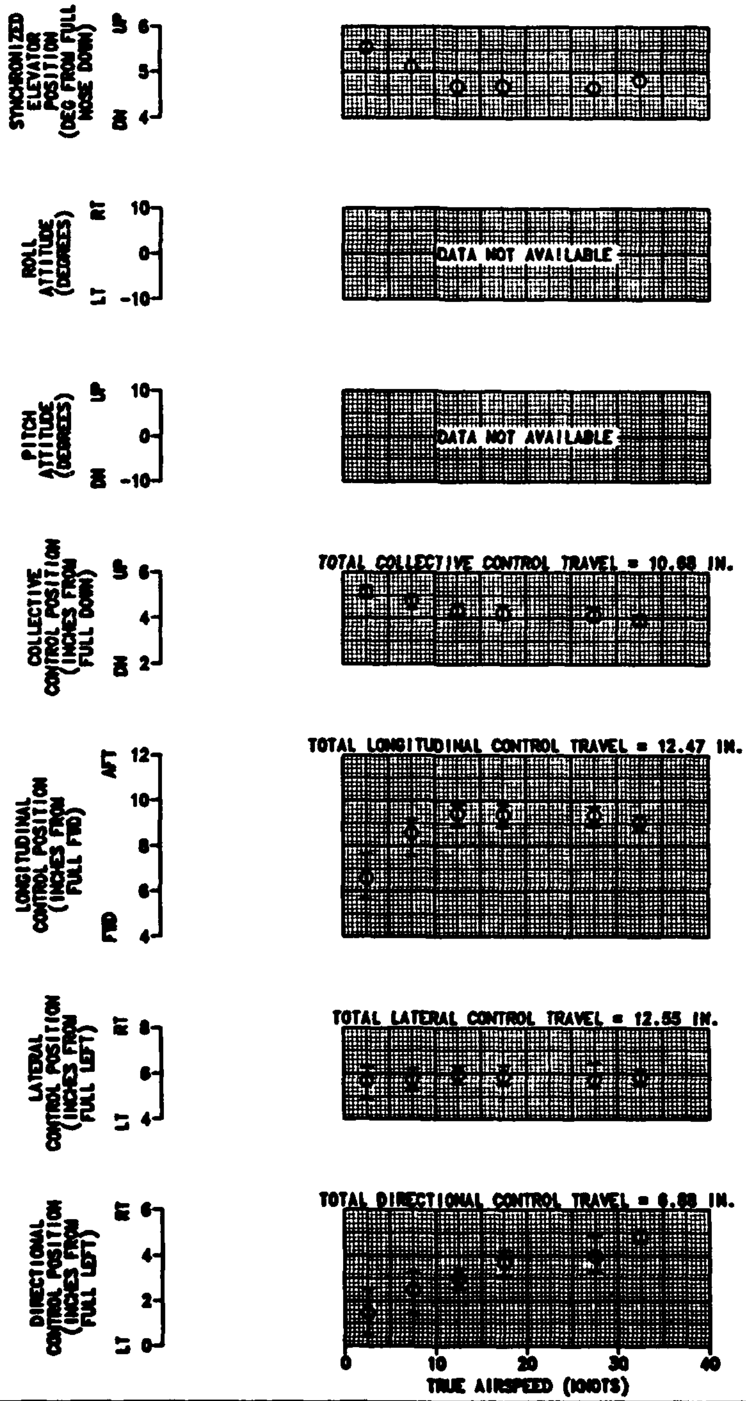


FIGURE E-97

LOW-AIRSPEED 270-DEGREE AZIMUTH FLIGHT CHARACTERISTICS

JUH-1H USA S/N 69-15532

IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8640	136.3	0.0	2190	10.5	324	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

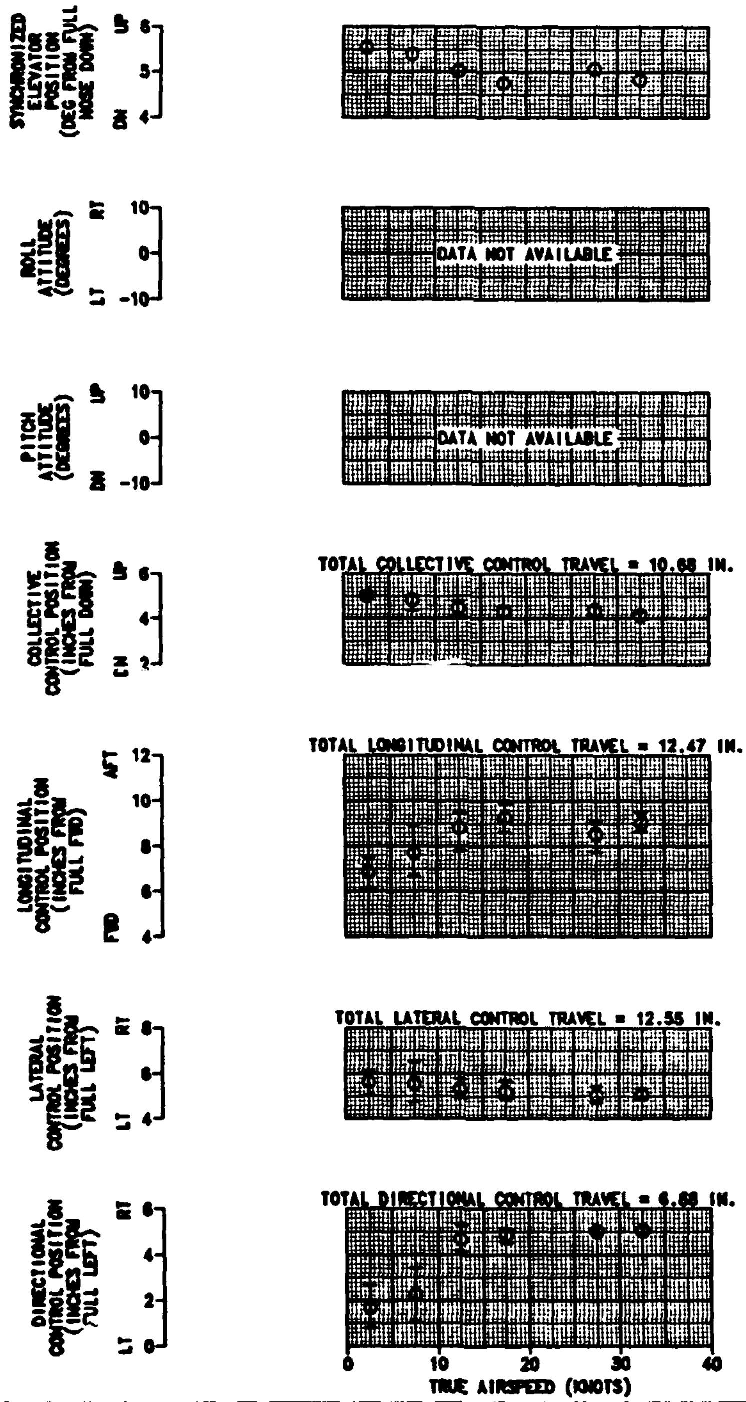


FIGURE E-98

LOW-AIRSPEED 300-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG SKID HEIGHT (FT)
8520	136.9	0.1LT	530	-0.5	322	10

NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.

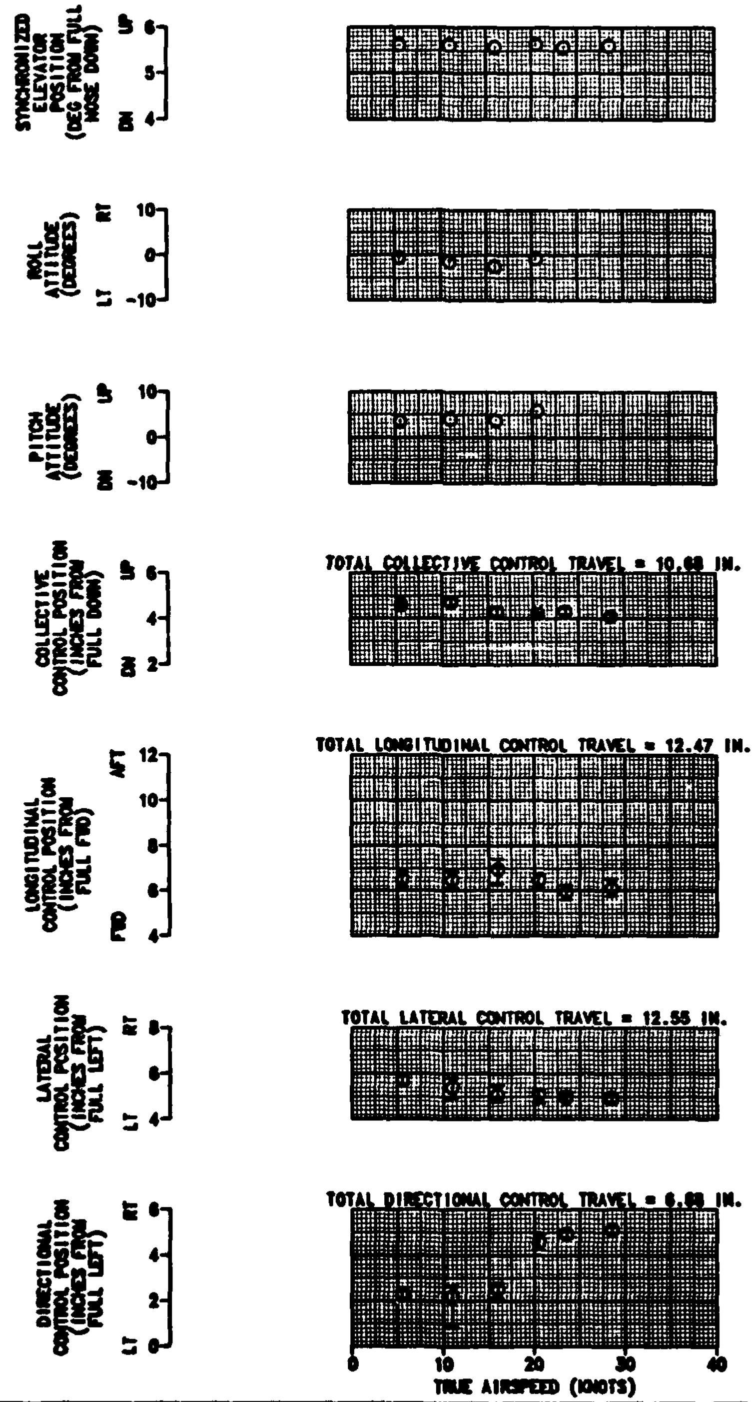
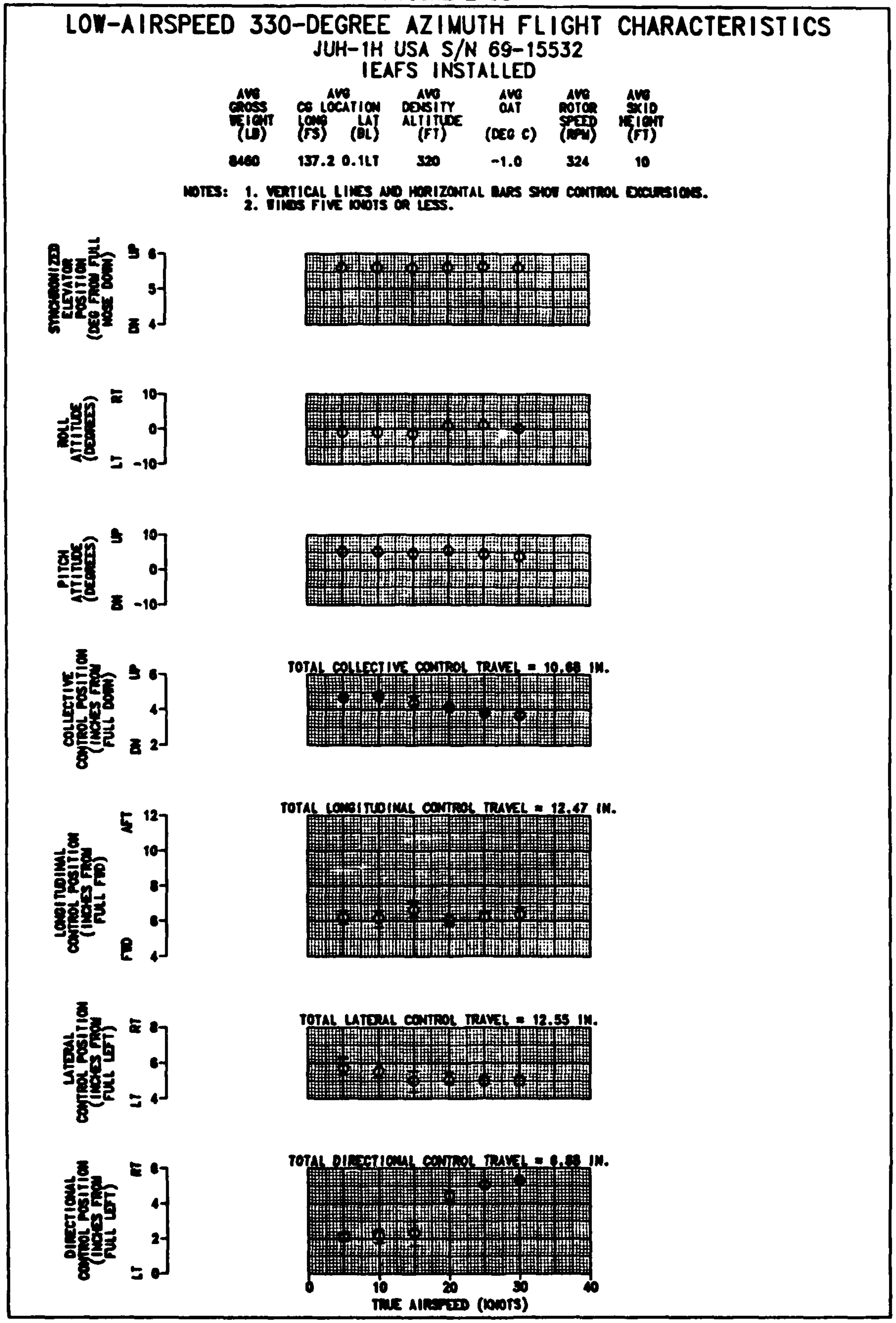


FIGURE E-99



LOW-AIRSPEED 330-DEGREE AZIMUTH FLIGHT CHARACTERISTICS
JUH-1H USA S/N 69-15532
IEAFS INSTALLED
AVG GROSS WEIGHT (LB) 8460
AVG CG LOCATION LONG (FS) 137.2 LAT (BL) 0.1LT
AVG DENSITY ALTITUDE (FT) 320
AVG OAT (DEG C) -1.0
AVG ROTOR SPEED (RPM) 324
AVG SKID HEIGHT (FT) 10
NOTES: 1. VERTICAL LINES AND HORIZONTAL BARS SHOW CONTROL EXCURSIONS.
2. WINDS FIVE KNOTS OR LESS.
SYNCHRONIZED ELEVATOR POSITION (DEG FROM FULL NOSE DOWN)
ROLL ATTITUDE (DEGREES)
PITCH ATTITUDE (DEGREES)
TOTAL COLLECTIVE CONTROL TRAVEL = 10.68 IN.
COLLECTIVE CONTROL POSITION (INCHES FROM FULL DOWN)
TOTAL LONGITUDINAL CONTROL TRAVEL = 12.47 IN.
LONGITUDINAL CONTROL POSITION (INCHES FROM FULL FWD)
TOTAL LATERAL CONTROL TRAVEL = 12.55 IN.
LATERAL CONTROL POSITION (INCHES FROM FULL LEFT)
TOTAL DIRECTIONAL CONTROL TRAVEL = 6.88 IN.
DIRECTIONAL CONTROL POSITION (INCHES FROM FULL LEFT)
TRUE AIRSPEED (KNOTS)

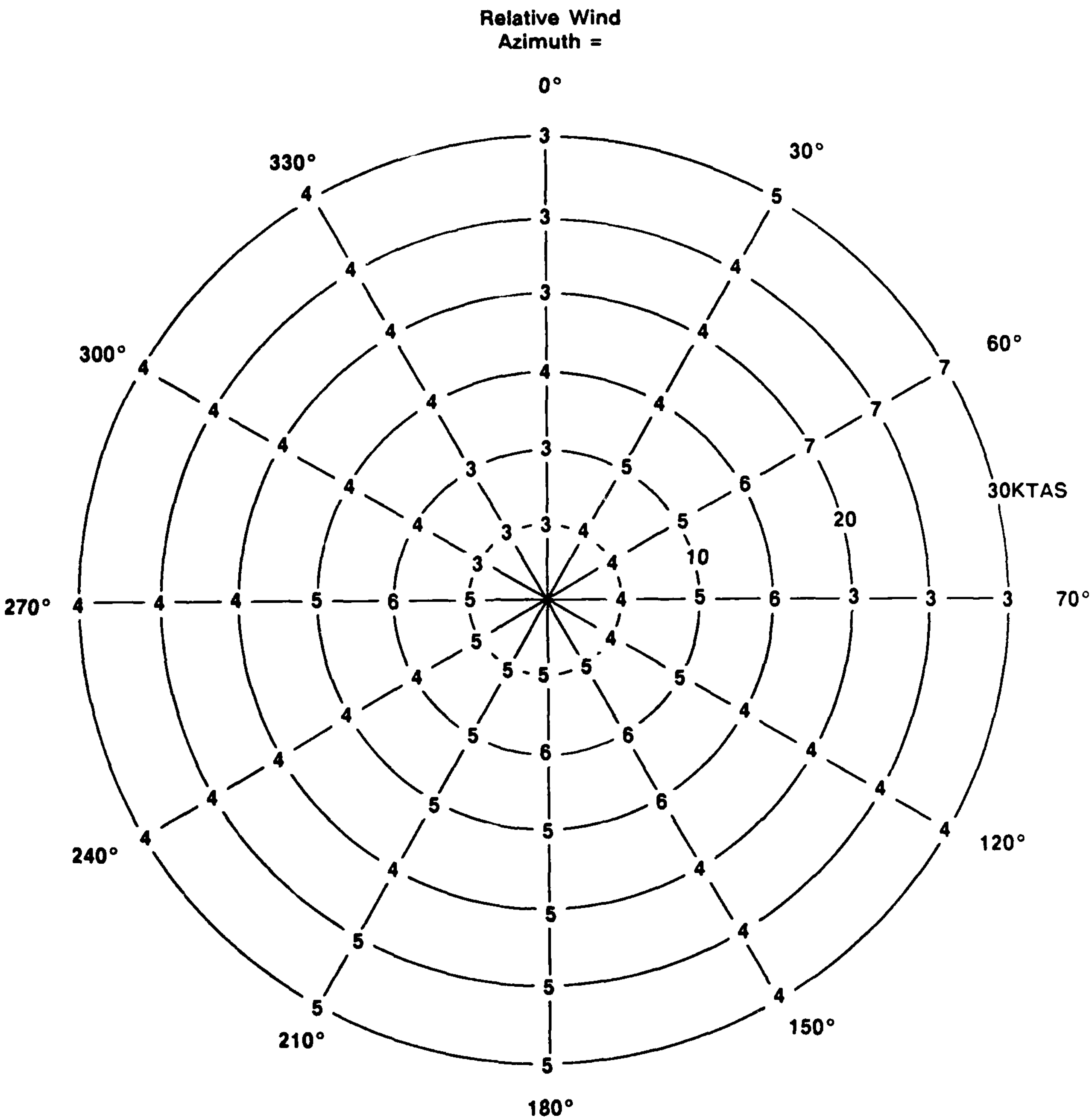


Figure E-100. Low-Speed HQR's

DISTRIBUTION

HQDA (DALO-AV)	1
HQDA (DALO-FDQ)	1
HQDA (DAMO-HRS)	1
HQDA (SARD-PPM-T)	1
HQDA (SARD-RA)	1
HQDA (SARD-WSA)	1
US Army Material Command (AMCDE-SA, AMCDE-P, AMCQA-SA, AMCQA-ST)	4
US Training and Doctrine Command (ATCD-T, ATCD-B)	2
US Army Aviation Systems Command (AMSAV-8, AMSAV-Q, AMSAV-MC, AMSAV-ME, AMSAV-L, AMSAV-N, AMSAV-GTD)	8
US Army Test and Evaluation Command (AMSTE-TE-V, AMSTE-TE-O)	2
US Army Logistics Evaluation Agency (DALO-LEI)	1
US Army Materiel Systems Analysis Agency (AMXSY-RV, AMXSY-MP)	8
US Army Operational Test and Evaluation Agency (CSTE-AVSD-E)	2
US Army Armor School (ATSB-CD-TE)	1
US Army Aviation Center (ATZQ-D-T, ATZQ-CDC-C, ATZQ-TSM-A, ATZQ-TSM-S, ATZQ-TSM-LH)	5
US Army Combined Arms Center (ATZL-TIE)	1
US Army Safety Center (PESC-SPA, PESC-SE)	2
US Army Cost and Economic Analysis Center (CACC-AM)	1
US Army Aviation Research and Technology Activity (AVSCOM) NASA/Ames Research Center (SAVRT-R, SAVRT-M (Library)	3

US Army Aviation Research and Technology Activity (AVSCOM)	2
Aviation Applied Technology Directorate (SAVRT-TY-DRD, SAVRT-TY-TSC (Tech Library)	
US Army Aviation Research and Technology Activity (AVSCOM)	1
Aeroflightdynamics Directorate (SAVRT-AF-D)	
US Army Aviation Research and Technology Activity (AVSCOM	1
Propulsion Directorate (SAVRT-PN-D)	
Defense Technical Information Center (FDAC)	2
US Military Academy, Department of Mechanics (Aero Group Director)	1
ASD/AFXT, ASD/ENF	2
US Army Aviation Development Test Activity (STEBG-CT)	2
Assistant Technical Director for Projects, Code: CT-24 (Mr. Joseph Dunn)	2
6520 Test Group (ENML)	1
Commander, Naval Air Systems Command (AIR 5115B, AIR 5301)	3
Defense Intelligence Agency (DIA-DT-2D)	1
School of Aerospace Engineering (Dr. Daniel P. Schrage)	1
Headquarters United States Army Aviation Center and Fort Rucker (ATZQ-ESO-L)	1
Commander, U.S. Army Aviation Systems Command (AMSAV-EA)	1
Commander, U.S. Army Aviation Systems Command (AMSAV-ECH)	1
Commander, U.S. Army Aviation Systems Command (AMSAV-EP)	1
Commander, U.S. Army Aviation Systems Command (AMCPM-UH1)	2